CONSTIPATION
AND
ALLIED INTESTINAL DISORDERS

ARTHUR F. HERTZ

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AND

ALLIED INTESTINAL DISORDERS

BY

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PREFACE

This book is the outcome of three years' research on the physiology and pathology of the movements of the alimentary canal. I have been fortunate in having had the invaluable assistance of numerous students of Guy's Hospital in the physiological part of the work: Messrs. F. Cook and E. G. Schlesinger have helped me throughout, and I desire also to acknowledge the help given me by Messrs. A. Neville Cox, H. Gardiner, G. H. Marshall and A. H. Todd. To Dr. C. J. Morton I am greatly indebted for his assistance in the X-ray investigations; Dr. A. C. Jordan and Dr. C. E. Iredell have also on frequent occasions given me their help in the examination of cases with the X-rays. I am very grateful to the physicians of Guy's Hospital for allowing me to investigate cases under their care.

Grants from the British Medical Association have helped to defray the expenses of the work, a preliminary account of which gained the Radcliffe Prize at Oxford University early in the present year.

Though the book is founded on my own investigations, and though I have endeavoured to put every statement to the proof, I have made a thorough study of the English, American, French and German literature on the subject. I may specially mention the physiological works of Starling (1906), Cohnheim

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(1907) and Magnus (1908); the monographs on constipation by James Hamilton (1806), O'Beirne (1833), Burne (1840), Birch (1861), Herschell (1899), Blake (1900), Sherman Bigg (1902) and Arbuthnot Lane (1904), — Illoway (1897) and Gant (1909), — Froussard (1903), — Ebstein (1901), Crämer (1906) and Singer (1909); the monographs on diseases of the intestines by Lauder Brunton (1901 and 1907), — Hemmeter (1901) and Tuttle (1903), — Mathieu (1901) and Loeper and Esmonet (1908), — Henoch (1858), Rosenheim (1893), Boas (1901), Ewald (1902) and Nothnagel (1904).

Among the large number of other authorities consulted, only those are included in the bibliographies, whose opinions or statements are referred to in the text.

Finally, I must express my deep obligation to Dr. C. H. Rippmann, Medical Registrar at Guy's Hospital, for his thorough revision of the manuscript. Almost every page of the book bears witness to his exceptional abilities as a scientific medical critic.

ARTHUR F. HERTZ.

1 Weymouth Street, W.
August, 1909.

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INTRODUCTION

Until recently the treatment of chronic constipation was experimental, one method being tried after another until by chance that suited to the individual case was discovered. This unsatisfactory state of affairs was due mainly to the fact that it was impossible to determine the actual part of the intestines, in which the delay causing the constipation occurs. In the case of medicinal treatment, the difficulty was made greater by the lack of reliable information as to the relative effects exerted by purgatives on different parts of the alimentary canal, so that there were no clear indications as to what drug, if any, should be employed in each case. It was formerly thought that enemata could not reach beyond the splenic flexure, and it was therefore assumed that constipation relieved by them was due to sluggish action of the lower part of the colon. But recent observations have shown that fluids introduced through the rectum reach the cæcum without difficulty.

Abdominal massage and hydrotherapy have been much employed in the place of drugs in the treatment of those severe forms of constipation, which do not yield to dietetic and other simple measures. Except in the cases associated with a weak abdominal wall, massage can only be of use in cases in which the accessible parts of the intestine do not function normally. It has, however, often been employed as a matter of routine for all cases of constipation, including many in which the inaccessible pelvic colon and rectum are alone at fault.

Finally, in severe cases of chronic constipation the ileum has been joined to the pelvic colon or rectum, and the intervening portion of the colon has been excised. This drastic treatment might, perhaps, be justified, if it were possible to make certain that an abnormal condition of the part of the intestines removed was the sole cause of the constipation. But as it was never known which part of the colon was at fault, it was not possible until after the operation to say whether the treatment suited the case.

Before the pathogenesis of the many varieties of constipation could be properly understood, it was necessary to obtain more accurate data than had hitherto been available, concerning the movements of the intestines and the process of defæcation in healthy men. With this object in view I commenced in 1907 a series of investigations with the assistance of Messrs. F. Cook, E. G. Schlesinger, A. N. Cox, H. Gardiner, A. N. Todd and G. H. Marshall, students of Guy's Hospital.[1]

I then attempted to determine what part of the intestines is to blame in different forms of constipation by tracing with the X-rays the passage of food mixed with a bismuth salt through the alimentary canal. It is only in the severer cases of chronic constipation, such as those in which the question of operative interference might possibly arise, that the somewhat prolonged investigations required could be profitably carried out in practice. But by comparing the results obtained by the X-rays with the clinical symptoms and signs, it has become possible to recognize in many cases by simple clinical methods what part of the intestine is at fault. The examination of a considerable number of cases has led me to propose a new classification of the causes of constipation, based on the definitely ascertained pathogenesis of each of the cases examined.[2] Finally, we have attempted to discover by the X-rays and other means the exact effect of the various drugs and other measures employed in the treatment of constipation.[3]

---

[1] A. F. Hertz, C. J. Morton, F. Cook, A. Neville Cox, H. Gardiner, E. G. Schlesinger, and A. N. Todd: *Guy's Hosp. Rep.*, lxi, 389, 1907.

[2] Preliminary accounts were published in the *Proceedings of the Royal Society of Medicine* for February, 1908, and in the *Archives of the Röntgen Ray* for June, 1908.

[3] A. F. Hertz, F. Cook, and E. G. Schlesinger: *Proc. Roy. Soc. Med.*, December, 1908.

PART I

THE PHYSIOLOGY OF THE INTESTINAL MOVEMENTS AND OF DEFÆCATION

CHAPTER I

THE SMALL INTESTINE

The old experimental methods, in which the viscera of an animal were exposed to view, demonstrated the occurrence of peristaltic waves, which propelled the contents of the small intestine slowly towards the cæcum. Cannon,[1] by means of X-ray examinations in cats and dogs, discovered that another and equally important type of movement occurred, which he named ‘ segmentation ’.

The shadow of the small intestine cannot, as a rule, be very definitely seen in man, owing to the rapid passage of the bismuth through it and the diminished concentration of the salt, due to the large quantities of digestive juices present. This probably accounts for the fact that, when we began our investigations, segmentation had never been observed in man. Some delay, however, occurs almost constantly in the last part of the ileum, so that it is by no means rare to see a well-defined shadow of the small intestine as it passes into the cæcum. Sometimes also the mixture of chyme and bismuth may be present in the duodenum and first few inches of the jejunum, and on rare occasions in other parts of the small intestine, in sufficient quantity for its shadow to be clearly visible. Under such conditions we have on numerous occasions observed well-marked segmentation. The shadow of a short length of small intestine, at first uniform in thickness, becomes constricted in its centre ; the constriction increases until the single shadow is more or less completely divided into two. Then each half undergoes a similar division, but the two central segments of the four thus produced join together. The new central segment then divides again, the segmentation continuing in one place at the rate of ten divisions in a minute and a half. The process, as seen with the X-rays, is shown somewhat diagrammatically in Fig. 1. We have at the same time watched the movement of the shadow as a whole, this being doubtless due to ordinary peristalsis. It was obviously impossible to ascertain the rate of progress, as the movement occurs in such varying directions and in more than one plane.

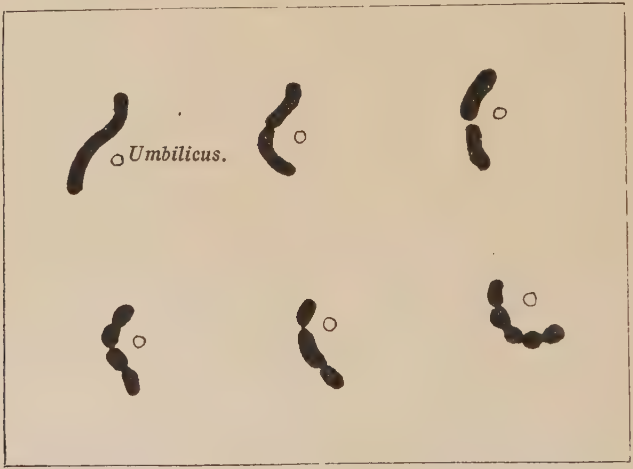

Fig. 1. Diagram of segmentation of human small intestine.

The function of segmentation is to mix the food thoroughly with the bile, pancreatic juice and intestinal juice, and at the same time to bring every portion into frequent contact with the absorbing mucous membrane. Mall[2] has also pointed out that it assists in the pumping of blood from the submucous venous plexuses into the radicles of the superior mesenteric vein, and in the discharge of chyle from the lacteals of the villi into the larger lymph-vessels of the mesentery.

On twelve occasions we made skiagraphic observations at short intervals on normal individuals who had taken an ordinary meal, to which one or two ounces of bismuth carbonate had been added, in order to determine how soon the first traces of the stomach contents reached the cæcum. We found that the shadow of the cæcum began to appear between three and a half and five hours, with an average of four and three-eighths hours, after the food had been taken; these results were subsequently confirmed by numerous other observations, in most of which the oxychloride was used instead of the carbonate. As the gastric contents begin to pass through the pylorus immediately after the commencement of a meal, it is clear that the average rate at which the contents of the small intestines travel is twenty-two and a half feet in four hours, or five feet and seven inches per hour, which is equivalent to about one inch per minute.

---

[1] W. B. Cannon: *Amer. Journ. of Phys.*, v, 257, 1902.

[2] F. Mall: *Johns Hopkins Hosp. Rep.*, i, 37, 1896.

CHAPTER II

THE COLON

UNTIL about four hours after breakfast the cæcum contains nothing but gas and sometimes a small quantity of fæcal material sticking to its mucous membrane. The fluid contents of the ileum, containing the unabsorbed part of the meal and the digestive juices, then begin to arrive, as shown by the X-rays and by the production of the cæcal sounds, which will be described later. Between one and two hours after the arrival of the first traces of fæcal material in the cæcum has been signalled by the onset of the sounds, the resonant note previously present over the cæcum, when the individual is examined in the vertical position, is replaced by a dull note, which gradually extends upwards as the cæcum and ascending colon become filled. Although part of the water taken by the mouth and secreted into the stomach and small intestine is absorbed before the colon is reached, observations on patients with cæcal fistulæ have shown that about 350 grms. of fluid material pass through the ileo-cæcal valve in a day, whereas the weight of the fæces averages 135 grms. The percentage of water diminishes from about 90 in the contents of the end of the ileum to about 75 in the fæces. Small quantities of sugar, fat and coagulable protein,* and of the products of their digestion reach the cæcum; as sugar, coagulable protein and the soluble products of digestion are absent from the fæces, these substances must be completely absorbed in the large intestine.

Most of the absorption of water and nutrient material in the large intestine takes place in the cæcum and ascending colon. The chyme which enters the cæcum from the small intestine is quite fluid, but as the cæcum and ascending colon gradually become filled, absorption occurs and the contents become less watery, though they always remain quite soft. This change in consistency can readily be demonstrated by percussion, as, when the resonant note of the cæcum is first replaced by a dull note, the latter disappears if the supine position is assumed, the fluid contents spreading along the posterior wall of the ascending colon when the individual lies down. Two or three hours after the first appearance of a dull area at the bottom of the cæcum, the upper border of the dulness, which has by this time reached some distance up the ascending colon, is altered only slightly or not at all on lying down. By means of palpation the same changes can be observed: five or six hours after breakfast a sensation of splashing or gurgling can be detected, although previously only the empty gut could be felt. Some hours later the splashing becomes less obvious and the cæcum appears to be filled with semi-solid material. These observations, which were published in 1907, have since been confirmed, so far as palpation is concerned, by Rosenheim.[1]

In the transverse colon more absorption occurs and the fæces become firmer, but very little change in consistency takes place during the passage through the descending colon, owing perhaps to the remarkably slight development of its lacteals in comparison with those of all other parts of the intestine (Roith [2]).

---

* The word 'protein' is used instead of 'proteid' in accordance with the recommendations of the Physiological Society.

The normal firm consistency of the stool is finally attained by the absorption of water in the pelvic colon, where the fæces are retained until the act of defæcation occurs.

When sufficient material has accumulated in the cæcum and ascending colon to produce slight distension, it is believed that movements in the previously inactive large intestine begin. Ordinary peristaltic waves, occurring much less frequently than in the small intestine, are supposed to carry the contents towards the rectum, but in some animals a considerable period elapses before much escapes beyond the proximal part of the colon, owing to the periodical occurrence of a series of antiperistaltic waves, several of which are often present simultaneously.* They force the contents of the colon towards the cæcum, the regurgitation of the contents of the colon into the small intestine being prevented by the ileo-cæcal sphincter, which will be described later. Hence antiperistalsis has the same effect in the large intestine that peristalsis has in the stomach when the pylorus is closed, the contents of the proximal part of the colon being caused to circulate and come into frequent intimate contact with the mucous membrane, with the result that rapid absorption of water and nutrient material occurs. A study of the comparative anatomy of the colon in animals and man led to the belief that antiperistaltic waves begin in man somewhere near the centre of the transverse colon, whence they travel slowly to the cæcum. I have watched the shadow of the human colon for various periods in a large number of both healthy and constipated individuals, but I have never yet seen anything which pointed to the occurrence of antiperistalsis. Though the outline of the colon is often very well defined, I have seen no waves of any sort passing either forwards or backwards. The shadow of the cæcum gradually becomes visible and the upper extremity of the shadow moves very slowly towards the rectum, except immediately after meals, when the progress is comparatively rapid. No constant pause in the centre of the transverse colon and no sign of any churning process have ever been seen.

---

* Antiperistalsis was accidentally discovered by C. Jacobi (*Arch. f. exp. Path. u. Pharm.*, xxvii, 147, 1890) in the course of some experiments on colchicum poisoning: it was subsequently investigated in cats with the X-rays by W. B. Cannon (*Amer. Journ. of Phys.*, vi, 251, 1902) and in the exposed intestines of various animals by T. R. Elliott and E. Barclay Smith (*Journ. of Phys.*, xxxi, 272, 1904).

The escape of fluid injected *per rectum* from a cæcal fistula has been supposed to point to the occurrence of antiperistalsis in man. By means of the X-rays I have observed a pint of a bismuth emulsion, introduced by rectum at a constant pressure of three feet of water, reach the cæcum and render the whole colon visible. But the flow was produced solely by hydrostatic pressure : there was not the slightest sign that the colon took any active part in carrying the fluid to the cæcum.

Roith, who is a firm believer in the occurrence of antiperistalsis in the proximal part of the human colon, brings forward as his most weighty evidence his accurate measurements of the relative fulness of different parts of the colon after death, which were confirmed by his observations during abdominal operations. He found that on an average the cæcum and ascending colon contained more than twice the amount of fæces present in an equal length of the transverse colon and three and a half times as much as an equal length of the descending colon ; he believes that this indicates that the fæces remain for a long time in the proximal part of the colon, where antiperistalsis occurs, and pass rapidly through the distal part. But this is negatived by our X-ray observations, which show that there is very little variation in the rate of passage through different parts of the colon. The results obtained by Roith are explained by the progressively smaller lumen of the large intestine from the cæcum to the descending colon, and by the fact that absorption occurs mainly in the cæcum and ascending colon. Moreover, the relative amount of fæces present in the ascending and the descending colon varies enormously according to the time, which has elapsed since the last meal and the last evacuation of the bowels, so that comparative measurements, which do not take these factors into account, are of little value.

It is natural to imagine that fæces are propelled through the large intestine by peristalsis. But I have never seen anything in the nature of a peristaltic wave passing along the shadow of the human colon, except during defæcation. I can only explain this by supposing that the waves move so extremely slowly that the movement cannot be appreciated.

Segmentation, as it occurs in the small intestine, never takes place in the colon, but both Elliott and Cannon have noticed in the exposed colon of animals oscillating movements of single sacculi, which result in churning of the intestinal contents. But I have never observed such movements in man, though perhaps they are too small to be visible except in the exposed intestine.

In order to determine the rate in which the fæces pass along the colon we have made X-ray examinations in eighteen normal individuals at various intervals after a bismuth meal, in two instances hourly, but more often four times on the first day, as well as once or more on subsequent days. It has already been stated that the shadow of the cæcum appears on an average in four and three-eighths hours after the meal has been eaten. The hepatic flexure is reached between five and eight hours after the meal, the splenic flexure between seven and fourteen hours, and the junction of the descending colon with the iliac colon * between eight and sixteen hours. The average times taken are four and a half hours to the cæcum, six and a half hours to the hepatic flexure, nine hours to the splenic flexure and eleven hours to the commencement of the iliac colon. The rate of progress through the iliac colon is about the same; but that through the pelvic colon appears to be slower, as in two individuals in whom it was timed six hours were required, but it cannot be really accurately estimated with the X-rays, as it depends upon how much fæcal matter is already present. Thus the passage of fæces through each part of the colon—the ascending, the transverse and the descending—requires about two hours, and about the same period is occupied in passing through the two feet of colon between the cæcum

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* According to the modern anatomical terminology, the *descending colon* ends in the *iliac colon* at the crest of the ilium: the iliac colon merges into the *pelvic colon* at the inner border of the psoas muscle.

and splenic flexure as through the twenty-two and a half feet of the small intestine.

The time normally required by the fæces to reach the pelvic colon has also been estimated by Rosenheim. Having confirmed by palpation our observations that in normal defæcation the descending colon, pelvic colon and rectum are completely emptied, he found that fæces could sometimes be felt in the pelvic colon about ten hours after breakfast and always a few hours later than this.

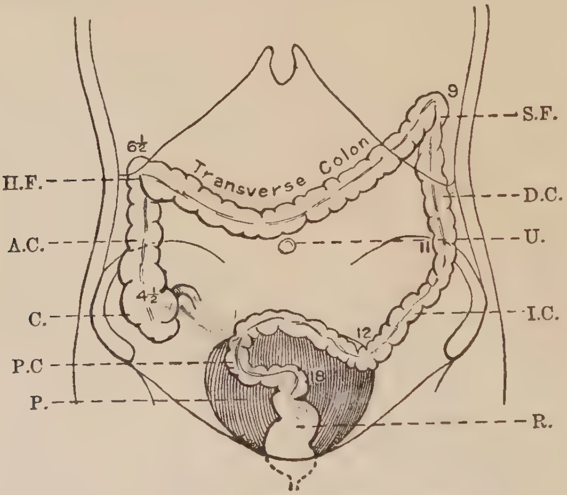

Fig. 2. Diagram of normal large intestine, the pelvic colon being represented in the position it occupies when full. The numbers represent the hours after a bismuth breakfast at which the different parts of the colon are reached. C., Cæcum; A.C., Ascending colon; H.F., Hepatic flexure; S.F., Splenic flexure; D.C., Descending colon; I.C., Iliac colon; P.C., Pelvic colon; R., Rectum; U., Umbilicus; P., Pelvis.

After a bismuth breakfast taken at 8 a.m. the shadow rarely reaches beyond the splenic flexure by four or five o'clock in the afternoon. In one normal individual, however, the iliac crest was reached in eight hours, and in another the end of the iliac colon in nine hours. If the bowels are not opened before the skiagraphic examination at 10 a.m., the most advanced portion of the remains of a bismuth breakfast of the previous day are generally found to have reached the pelvic colon. Fig. 2 shows the average time at which various parts of the colon are reached, if a bismuth breakfast is taken at 8 a.m. Fig. 3 is reproduced from actual tracings made on the fluorescent screen at various periods after a bismuth breakfast had been eaten by a normal individual.

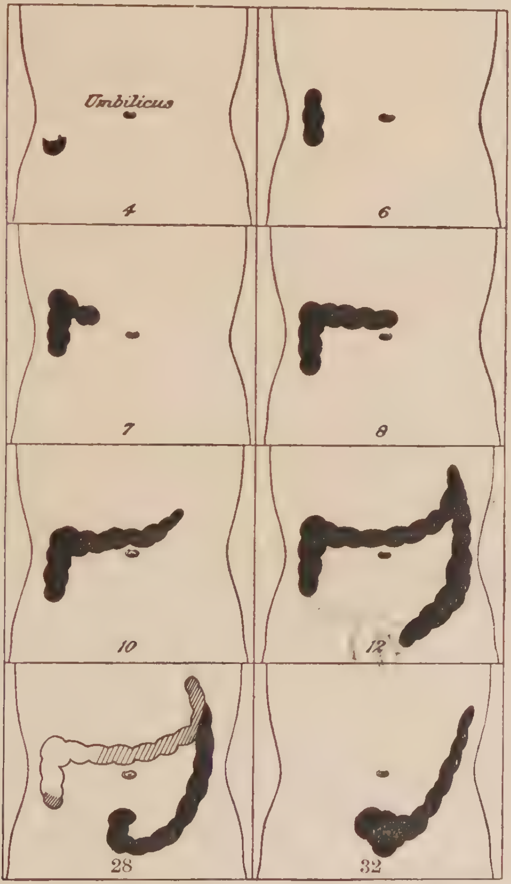

Fig. 3. Series of colon skiagrams in a normal individual. The numbers in this and other figures represent the hours after a bismuth meal was taken.

The activity of the whole of the large intestine during defæcation causes some of the fæces in the distal half of the transverse colon to enter the descending colon, from which it is evacuated, together with all the fæces already present between the splenic flexure and the anus. Hence if food is taken nine or ten hours before defæcation, some of its residue is present in the stool. If, however, it is taken less than nine hours before defæcation none of it can reach the splenic flexure by the time the act occurs and be present in the fæces. It continues to advance until it reaches the pelvic colon, where it remains until the next act of defæcation. If this occurs twenty-four hours after the previous act, and if the latter takes place about eight hours after a meal, the residue of the meal must occupy thirty-two hours in its passage through the alimentary canal. Thus if the bowels are opened once a day, the interval between a meal and the excretion of its residue varies approximately between nine and thirty-two hours, the time depending upon the hour of the meal and that of defæcation.

When the shadow of the cæcum first becomes visible, four and a half hours after a meal, that of the stomach can frequently still be seen. The remnant of food in the stomach at this period also takes about four and a half hours to reach the cæcum, so that at least nine hours elapse after a meal, before the last traces of the products of its digestion pass through the ileo-cæcal valve. As in nine hours the splenic flexure is generally reached by the material which first arrived in the colon, the shadows of the cæcum, ascending colon and transverse colon are normally still visible, when that of the splenic flexure is first seen. If no more food is taken, the cæcum and ascending colon are almost empty by the time the iliac colon is reached ; but they are often still visible with the X-rays, owing to a thin layer of fæcal material mixed with bismuth being still adherent to the mucous membrane. Thus the morning after a bismuth meal the cæcal shadow is often still visible, although it certainly contains only traces of fæces. Hence in studying the motor activity of the intestine, the time at which the shadow of any part first appears is of much more importance than the length of time it remains visible.

[1] Th. Rosenheim : *Deutsche med. Woch.*, xxxv, 745, 1909.

[2] O. Roith : *Mitt. aus d. Grenzgeb. d. Med. u. Chir.*, xix, 33, 1908.

CHAPTER III

THE ILEO-CÆCAL VALVE AND SPHINCTER

No mixing takes place under normal conditions between the contents of the small and the large intestines, so that material which has once reached the cæcum can never return into the ileum, even if antiperistalsis really occurs. This has been believed to be due to the mechanical action of the ileo-cæcal valve, ever since its discovery in 1579 by Caspar Bauhin, who found that after death it can resist a moderate pressure from the side of the colon, but very little from the side of the small intestine.

In 1903 Keith suggested from anatomical considerations that a strong ileo-cæcal sphincter exists in man and most animals, as the transverse layer of the muscular coat of the ileum is greatly thickened where it enters the colon. In the following year Elliott[1] proved experimentally that such a sphincter exists. He found that it was kept in a condition of moderate tonic contraction by impulses carried by the splanchnic nerves; when these were cut it became permanently relaxed, and the contents of the small and large intestines mixed freely with each other. Direct stimulation of the splanchnic nerves or the reflex effect of momentary exposure of the peritoneum to cold air caused the sphincter to contract tightly, at the same time as the movements of the rest of the intestines were inhibited. Stimulation of the vagus and pelvic nerves had no influence on it.

In the animals in which antiperistalsis of the colon occurs the sphincter probably contracts whenever such a wave arrives at the cæcum, so that regurgitation of the contents of the large into the small intestine is prevented.

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[1] T. R. Elliott: *Journ. of Phys.*, xxxi, 157, 1904.

CHAPTER IV

INTESTINAL SOUNDS

In 1705 a posthumous work by Robert Hooke[1] was published, in which he suggested 'that it may be possible to discover the motions of the internal parts of Bodies . . . by the sound they make, that one may discover the works performed in the several Offices and Shops of a Man's Body, and thereby discover what Instrument or Engine is out of order, what Works are going on at several times and lie still at others'. In this connexion he mentioned the noises produced by the 'motion of wind to and fro in the guts'. But it was not until exactly two centuries later that the first serious attempt was made to analyse the numerous sounds, which can be heard on auscultating the abdomen. In 1905 Cannon[2] succeeded in demonstrating the rhythmical production of sounds in the stomach and small intestines of normal individuals. Though we have on a few occasions been able to confirm his observations on the stomach, we have never recognized any rhythm in the sounds produced in the small intestine.

As it had occurred to me that the rhythmical squirting sounds heard over the cæcum might be due to the entry of the fluid contents of the ileum through the ileo-cæcal valve, we listened on a number of occasions at short intervals throughout the morning and afternoon to the sounds heard when the stethoscope was placed over the cæcum of normal individuals. Before deciding that any series of sounds originated in the cæcum, we listened to other parts of the abdomen, so as to determine whether anything similar in character and rhythm could be heard elsewhere.

In the morning before breakfast, about twelve hours after the last meal had been eaten, no sound could ever be heard over the cæcum. The silence continued until between three and a half and four and a half hours after breakfast, when a few sounds could be heard, which were quite distinct from anything present in other parts of the abdomen. The sounds gradually became louder and more frequent, until they reached a maximum in one hour to two and a half hours after their commencement. After this it is not of much use to listen to the cæcum again, as the relation of the sounds to the time at which breakfast was taken is confused by the taking of other meals.

The action of the ileo-cæcal sphincter is at once upset by irritation of the neighbouring peritoneum, produced, for example, by the presence of foreign material after perforation of an inflamed appendix. Contact of foreign material gives rise reflexly to stimulation of the splanchnic nerves, whereby cessation of the motor activity of the neighbouring intestine is produced. It follows also from Elliott's experiments that spasmodic contraction of the ileo-cæcal sphincter must occur when the neighbouring peritoneum is exposed to irritation. The passage of the contents of the end of the ileum into the cæcum is thus stopped, and cæcal sounds cease to be produced. A knowledge of these facts can be of considerable value in determining the exact state of affairs in cases of appendicitis.[3] The majority of patients, when first examined, have been taking fluids at short intervals during the previous few hours, so that, in the absence of vomiting, frequent sounds are heard over the cæcum, so long as there is no reflex stimulation of the splanchnic nerves. If, however, peritonitis is present in the neighbourhood of the ileo-cæcal junction, as it is in the majority of the severer cases of acute appendicitis, no sounds are heard.

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[1] R. Hooke: *Posthumous Works*, London, 1705. *The Method of Improving National Philosophy*, p. 39. Quoted by Cannon, *loc. cit. infra.*

[2] W. B. Cannon: *Amer. Journ. of Phys.*, xiv, 339, 1905.

[3] A. F. Hertz: Abdominal Auscultation as an aid in Diagnosis: *Brit. Med. Journ.*, ii, 1602, 1908.

CHAPTER V

THE NORMAL STIMULI AND THE NERVOUS CONTROL OF THE INTESTINAL MOVEMENTS

THE muscles of the stomach and small intestine receive through the splanchnic nerves sympathetic fibres (Fig. 4), which originate in the lower dorsal and upper lumbar region of the spinal cord, and have their cell-station in the solar plexus; the sympathetic nerve-supply to the colon originates in the lower lumbar region, the cell-station being in the inferior mesenteric ganglion. The stomach and small intestine are also supplied with fibres from the vagi; the large intestine is supplied through the pelvic nerves with fibres from the sacral cord, which are unconnected with the sympathetic system and are physiologically equivalent to the vagi. The vagal and sacral fibres end in connexion with ganglion cells situated between the circular and

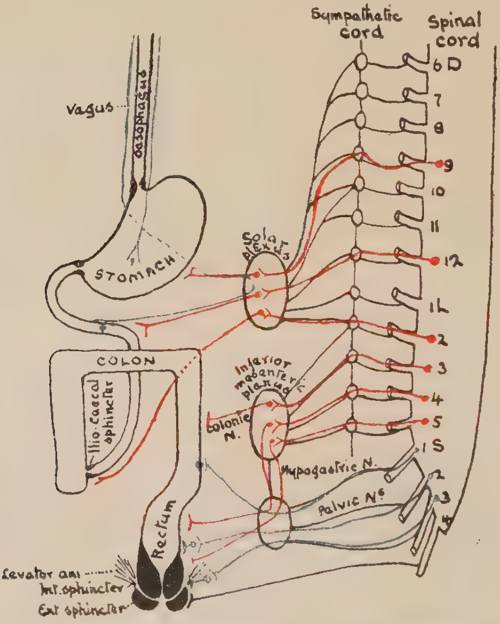

FIG. 4. Diagram of nerve-supply to the alimentary canal.

longitudinal muscular layers, where they constitute Auerbach's plexus.

Stimulation of the splanchnic nerves diminishes the tone of the gastric and intestinal muscles and inhibits their normal movements, whereas stimulation of the vagi or, in the case of the colon, the pelvic nerves increases the muscular tone and the strength of the movements after temporarily inhibiting them.

In spite of the fact that they possess this double nerve-supply, the stomach and intestines can perform their functions to a great extent independently of the central nervous system. Thus peristalsis occurs in excised stomachs and intestines which have been kept moist and warm. Aldehoff and v. Mering[1] have shown, moreover, that the tone and movements of the stomach and intestines remain normal for months after both vagi have been cut just above the diaphragm, and also after destruction of the cœliac plexus.

From these experiments it is clear that the peristalsis of the stomach and intestines is to a great extent independent of the central nervous system. Magnus[2] has shown that separated strips of intestinal muscle are only capable of spontaneous rhythmical contractions if the local nerve-plexus is removed with them. Otherwise the refractory period after activity is abolished, so that a continuous stimulus produces tetanus instead of rhythmical contractions. It is therefore probable that the motor functions of the stomach and intestines depend on reflexes, which have their centre in the nerve-cells of Auerbach's plexus. This is confirmed by the observations of Yanasi[3] that the intestinal muscle of the embryo guinea-pig, though contracting when directly stimulated, is only capable of spontaneous activity after the development of Auerbach's plexus.

There is, however, no doubt that under certain conditions the movements of the stomach and intestines can be directly or reflexly influenced by the central nervous system. Thus pleasurable emotions and excitement may be followed by diarrhœa, and Cash[4] discovered by direct observation of the small intestines of a dog that intestinal peristalsis was increased by the smell of food or the mere act of swallowing, and that the entry of food into the stomach produced still more vigorous movements. We have, moreover, discovered that the taking of food is the most powerful of all stimuli to the motor activity of the colon in man. Thus, in an individual who had taken a bismuth supper the previous evening, the cæcum, ascending colon and most of the transverse colon were seen before breakfast and the end of the ileum was also faintly visible. Three-quarters of an hour later, immediately after breakfast, the ileum was no longer visible at all, and the shadow of the whole of the colon as far as the junction of the iliac with the pelvic colon was clearly seen (Fig. 5). As in three-quarters of an hour, apart from meals, the advance of the bismuth can hardly be recognized, the breakfast clearly acted as a powerful stimulus to peristalsis of the colon and also of the ileum, as shown by the emptying of the latter into the cæcum.

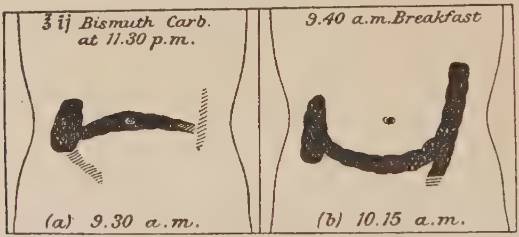

FIG. 5. Effect of breakfast on the movements of the colon.

A still more striking result was obtained by making hourly skiagraphic examinations until late in the evening after a bismuth breakfast (Fig. 6). It was found that, apart from meals, the progress through the colon was exceedingly slow, and that often no appreciable change could be observed after a whole hour. On the other hand, the fæces advanced considerably after each meal, much more progress having been made, for example, during the hour in which dinner was taken than in the previous four hours. The effect of food entering the stomach on the intestinal movements must clearly be due to reflex action, aided perhaps, as in the case of the digestive secretions, by the psychical effects of taking food.

The stimulating action of a meal on the intestinal movements, when present in an exaggerated degree, must be the cause of the condition observed sometimes (as in Case 3) in nervous individuals, in which a meal is always followed by a desire to defæcate. Normally the desire is only felt after breakfast, partly owing to habit and the simultaneous occurrence of a number of other stimuli, but partly because the stimulus of food, entering a completely empty stomach after a fast of twelve hours, is greater than that produced by food taken in the middle of the day or in the evening at a comparatively short interval after the previous meal.

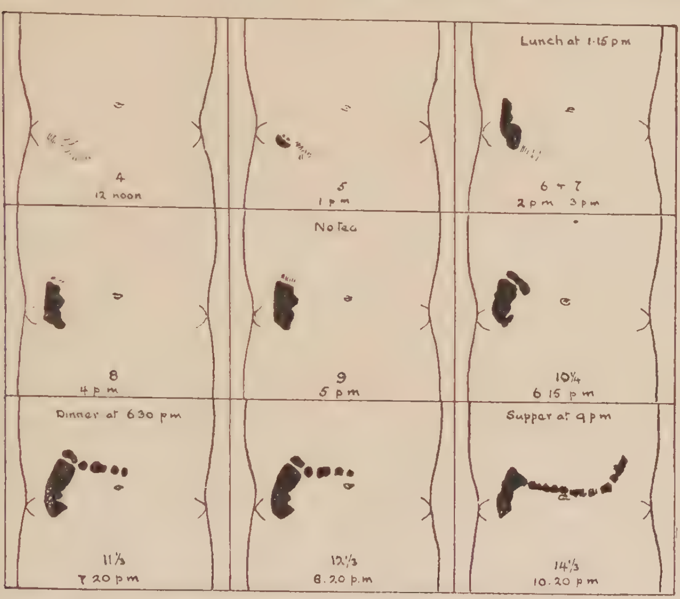

FIG. 6. Hourly tracings to show effect of meals on the movements of the colon.

The intestinal movements may under certain conditions be inhibited by nervous influences. Thus Cannon found that the movements in his cats ceased when they were excited or angry, an observation which explains the indigestion so frequently caused by unpleasant emotions. This effect of anger still occurred when both vagi were cut, so it must be due to impulses which pass along the splanchnic nerves. Pawlow, moreover, showed that reflex inhibition of the gastro-intestinal movements was produced by stimulation of many sensory nerves, the efferent impulse being carried by sympathetic nerve fibres. This is no doubt one of the principal factors in the causation of the deficient digestion, which often accompanies pain in any situation, and of the reflex constipation, to which reference will be made in a later chapter.

Reflex inhibition is very easily aroused from the peritoneum, mere exposure to the air being sufficient to give rise to temporary inhibition of most of the movements. This partly explains the fact that the stomach and intestines are nearly always at rest when an abdominal operation is in progress, and that in animals the movements can only be observed after the splanchnic nerves have been divided, so that the efferent branch of the reflex is broken. Cannon has, however, shown that the effect of exposure only lasts as long as the exposure continues. As neither cooling of the intestines nor anæsthesia has any effect on the subsequent activity of the intestines, the paralysis of the bowels, which may occur after abdominal operations, is due, as the observations by Cannon and Murphy[5] show, to the effects of handling the viscera. The peritoneal reflex is protective in cases of perforation of an abdominal viscus, as the movements of the stomach and intestines are inhibited by the presence in the peritoneal cavity of foreign matter, the spread of which is consequently delayed.

The recent investigations of Henderson[6] have shown that the inhibition of movements when the viscera are exposed during an operation is, to a great extent, chemical rather than reflex in origin. Bokai[7] proved many years ago that carbon dioxide is a powerful stimulant to the intestinal movements. When the viscera are exposed to the air, exhalation of carbon dioxide occurs, so that the tone and movements of the stomach and intestines are diminished. Moreover, in operations performed under ether, the excessive respiration causes the carbon dioxide in the arterial blood to be subnormal; the amount present in the intestines is thus further diminished and the chemical inhibition of the movements is increased. In support of this view, Henderson has shown that the gastric and intestinal movements are no longer inhibited, if means are taken to prevent the local exhalation of carbon dioxide from the viscera and the excessive aeration of the lungs.

Henderson also believes that the inhibition produced on stimulating sensory nerves and that associated with depressing emotions is partly due to deficiency of carbon dioxide in the blood, resulting from increased rapidity of respiration. The latter is, however, by no means constant, so that the inhibition in these conditions is probably mainly, if not entirely, nervous in origin.

The local reflexes, which give rise to intestinal movements, are produced by mechanical and chemical stimuli. Bayliss and Starling [8] discovered in 1899 that mechanical irritation of any part of the intestines causes contraction to occur above and relaxation below it. This combination of a proximal contraction with a distal relaxation causes the contents to move onward, with the result that a wave of contraction, preceded by a wave of relaxation, passes down the intestines; such a compound wave constitutes true peristalsis. The mechanical stimulation is produced by the direct action of indigestible and undigested remnants of food and by the distension they produce, when mixed with the digestive juices and the multitude of bacteria present in the colon. Cannon's observations on cats and our observations on human beings show that the contractions which give rise to segmentation depend mainly on distension, as they occur only where this is greatest.

Fragments of vegetable food, consisting of indigestible cellulose together with the starch and protein, which have escaped digestion owing to their covering of cellulose, are the most important of the articles of diet which mechanically stimulate the intestinal movements. When the food is insufficiently chewed, lumps of undigested meat act in the same way. The distension of the duodenum by the mixture of the chyme from the stomach with the bile and pancreatic juice stimulates its peristalsis and segmentation. The rest of the small intestine is rarely distended, except the end of the ileum, where segmentation is again active, owing to the accumulation of fæces, which occurs as a result of the delay at the ileo-cæcal sphincter. The amount of distension in the colon depends upon the diet, as vegetable food not only leaves a larger residue than animal food, but it also produces a greater quantity of intestinal secretion and favours the development of larger numbers of bacteria.

The extreme importance of the mechanical stimulation of the intestines is seen in herbivora, which die if they are given insufficient cellulose, in carnivora, which require bones, and in corn-eating birds, which require sand and feathers in order to maintain their intestinal activity. In man severe constipation results if a diet completely devoid of vegetables is taken.

Much of the activity of the intestines depends on the chemical stimulation produced by certain constituents of the food and of the products of their digestion and bacterial decomposition. Vegetable food is of much greater importance than animal food in this connexion. Sugar, whether present in the food or produced in the course of digestion of starch, which is itself inactive, stimulates peristalsis in the small intestine, but not in the colon (Roger[9]), in which, however, it is rarely present owing to its almost complete absorption before the end of the ileum is reached. Organic acids, such as formic, acetic, butyric, tartaric, citric and lactic acids and their salts, which are either produced in the intestines by fermentation of carbohydrates, or are already present in vegetables and fruit, stimulate peristalsis, but corresponding with its relative sluggishness, the colon is less affected than the small intestine and rectum (Bokai[10]). The over-active peristalsis produced by pathological excess of these acids leads to diarrhœa, and at the same time the irritation of the intestinal mucous membrane may give rise to inflammation.

Undigested animal food produces no chemical stimulation, except for the extractives it contains, but even these affect the small intestine only (Straschesko [11]). Peptone acts as a feeble stimulant in the small intestine (Roger [9]), and probably the amido-acids produced at a later stage of digestion act on all parts of the gut. Of the products of putrefaction of proteins in the colon indol and phenol are inactive, and skatol has no effect except when introduced experimentally in quantities greater than those ever occurring, even under pathological conditions, in the human intestines (Bokai [10]).

Oil increases the movements of the small intestine (Straschesko [11]), and the products of its digestion and bacterial decomposition—glycerin, fatty acids and soaps—are comparatively powerful stimulants, which act on the colon as well as on the small intestine.

Carbon dioxide and marsh gas, produced by fermentation of carbohydrates, and sulphuretted hydrogen, produced by putrefaction of proteins, actively stimulate peristalsis in all parts of the intestine (Bokai [7]). The strong intestinal movements which often occur in the moribund are due to excess of carbon dioxide and deficiency of oxygen in the blood, as carbon dioxide stimulates and oxygen inhibits peristalsis, whether they be present in the intestinal lumen or in the circulation.

Thus both the mechanical and the chemical stimulation of the intestinal movements is greater with a vegetable than with a meat diet. Consequently peristalsis is more vigorous in herbivorous than in carnivorous animals and in vegetarians than in people who take a mixed diet. In a later chapter two series of skiagraphic tracings are reproduced (Fig. 12), which show how the activity of all parts of the intestines was increased by the addition of vegetables to the diet of a young man, who had long been very constipated as a result of taking food which was deficient in stimulating constituents.

Bile stimulates peristalsis in the colon but not in the small intestine (Schüpbach [12]), but it cannot be of great importance, as the bowels remained perfectly regular without the use of aperients in a patient of Mayo Robson's [13] with a biliary fistula, from which all the bile escaped for sixteen months. Pancreatic juice, water and normal saline solution at the body temperature have no action. Strong solutions of common salt introduced directly into the intestines give rise to intestinal movements, but taken by the mouth they have no such effect, because, as Otto[14] has shown, the pylorus remains closed until salt solutions present in the stomach become isotonic with the blood.

The movements of the colon appear to be considerably more sluggish during the night than the day. Thus in one individual, in whom only eight hours were required for bismuth taken at breakfast to reach the end of the descending colon, bismuth taken at 10.30 p.m. had only reached the hepatic flexure by 10.30 the following morning. This is due to the absence during the night of the stimulation produced by food and by exercise.

Cash[4] discovered by direct observation on a dog that exercise stimulates the intestinal movements. The effect of exercise is probably partly due to the mechanical stimulation produced by the rhythmical variations in the intra-abdominal pressure, caused by the increased respiratory excursions of the diaphragm. The movements of the abdominal muscles and of the psoas and iliacus must produce a similar effect.

Although it is well established that thermal stimuli influence the motor activity of the alimentary canal, when directly applied to the gastric or intestinal wall, it is not clear to what extent they can exert any action under normal conditions. A glass of cold water, and to a less extent a glass of very hot water, taken before breakfast undoubtedly promote the action of the bowels in many individuals. A cold compress or douche applied to the abdominal wall appears to have a similar effect, whilst warm applications are exceedingly efficacious in diminishing the over-activity of the intestines in cases of colic. Under all these conditions the action must be reflex, as Müller[15] found that hot and cold fluids are retained in the stomach until they reach the body temperature, and it is quite impossible for the intestines to be cooled or warmed through the abdominal muscles. In the case of the stomach, however, the intestines in immediate contact with the organ might receive a direct thermal stimulus. Cold is a stimulant of peristalsis, as a cold enema gives rise to strong contractions, which are often accompanied by colic. A hot enema seems to have a more sedative influence, but its action can hardly be compared with that of a cold one, as it is impossible to give it at a temperature more than a few degrees higher than that of the body, whereas an ice-cold injection can be used without danger. Bokai,[16] however, showed that a rise in temperature in the blood increased the excitability of the inhibitory nerves to the stomach; hot fluids in the intestinal lumen probably have the same effect.

[1] G. Aldehoff and J. v. Mering: *Kongr. f. inn. Med.*, xvii, 333, 1899.

[2] R. Magnus: *Pflügers Arch.*, cii, 515, 1904; cxi, 152, 1906.

[3] J. Yanasi: *Pflügers Arch.*, cxvii, 345, 1907.

[4] J. T. Cash: *Proc. Roy. Soc.*, xli, 212, 1886.

[5] W. B. Cannon and T. F. Murphy: *Annals of Surgery*, xliii, 513, 1906.

[6] Yandell Henderson: *Amer. Journ. of Phys.*, xxiv, 66, 1909.

[7] A. Bokai: *Arch. f. exp. Path. u. Pharm.*, xxiii, 209, 1887.

[8] *Vide* E. H. Starling: *Recent Advances in the Physiology of Digestion.* London, 1906.

[9] H. Roger: *Journ. de Phys. et Path. gén.*, viii, 54, 1906.

[10] A. Bokai: *Arch. f. exp. Path. u. Pharm.*, xxiv, 153, 1887.

[11] Straschesko, quoted by R. Magnus: *Ergebnisse der Physiol.*, vii, 47, 1908.

[12] A. Schüpbach: *Zentralbl. f. Physiol.*, xxxi, 365, 1907.

[13] A. W. Mayo Robson: *Proc. Roy. Soc.*, xlvii, 499, 1890.

[14] E. Otto: *Arch. f. exp. Path. u. Pharm.*, lii, 370, 1905.

[15] Joh. Müller: *Zeitsch. f. diät. u. physik. Ther.*, viii, 586, 1905.

[16] A. Bokai: *Arch. f. exp. Path. u. Pharm.*, xxiii, 414, 1887.

CHAPTER VI

DEFÆCATION

James O'Beirne published in 1833 his *New Views of the Process of Defecation*, which still form the foundation of our knowledge of the subject. No further observations of importance were made in the next seventy years, except with regard to the nervous control of defæcation. Then, in 1902, Cannon[1] watched the process by means of the X-rays in a cat. More recently we have observed the changes occurring in the shadow of the large intestine during defæcation in an individual, who had taken bismuth carbonate with each of his meals on the previous day, and on six other occasions we have made tracings of the shadow immediately before and immediately after defæcation in order to find out how much of the colon takes part in the process.

Before describing the mechanism of defæcation, certain points with regard to the anatomy of the pelvic colon and rectum must be considered.* The pelvic colon forms a freely movable loop, about seventeen inches long. Among two hundred pelvic colons measured by Byron Robinson [2] the longest was thirty-three inches and the shortest five inches. In its most typical arrangement it passes from the termination of the iliac colon at the inner margin of the left psoas muscle across the pelvis to the right side, where it bends backwards and turns again to the left, till it reaches the front of the body of the third sacral vertebra, where it ends by forming, when empty, an acute angle with the rectum (Fig. 7). Its mesentery is long, but its extremities are in close proximity to each other. It varies greatly in position, lying when empty in the back part of the pelvis immediately in front of the rectum. As it becomes full, it rises into the abdominal cavity, so that the angle it forms with the rectum becomes less acute (Fig. 2).

The rectum is between four and six inches long and lies in contact with the sacrum and coccyx, its course being curved with the concavity directed forwards. Beyond the coccyx the lower inch and a half rests on the two levator ani muscles, which also support it laterally, and on the fibro-muscular ano-coccygeal body, which occupies the space between the coccyx and anus. The lumen of the upper part of the rectum is normally obliterated, the anterior and posterior walls being in contact so as to form a transverse slit. The same condition is sometimes present in the lower part or ampulla of the rectum, but its walls are at least equally often separated to form a cavity, which normally contains gas and a very small quantity of fæces. At its termination the rectum bends slightly backwards, passes through the pelvic floor between the levator ani muscles, and merges into the anal canal. This is a narrow passage, about an inch in length ; as it passes between the levator ani muscles its lateral walls are brought into apposition with each other and the rest of its lumen is obliterated by the tonic contraction of the internal sphincter, which is formed by a thickening of the circular fibres of the muscular coat of the colon, and the external sphincter, a voluntary muscle, which surrounds the lower part of the canal and the anal orifice and is continuous above with the levator ani muscles (Fig. 8). In old and weakly individuals the internal sphincter is relaxed, and the dilated canal forms part of the ampulla of the rectum. The rectum is smooth and not sacculated like the rest of the colon, as the longitudinal bands of the latter merge into a uniform layer, which together with the layer of circular fibres forms a muscular coat thicker than that of any other part of the intestines.

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* The modern description of the last part of the large intestine, which we owe chiefly to the investigations of Treves and Jonnesco, is adopted here in place of the old and inaccurate division into the sigmoid flexure and three parts of the rectum. The *iliac colon* consists of that part of the sigmoid flexure which extends from the end of the descending colon at the crest of the ilium to the inner margin of the psoas muscle, and the *pelvic colon* includes the rest of the sigmoid flexure and what was formerly called the first part of the rectum. The second part of the rectum is represented by the whole of the *rectum* of the new terminology, the third part being called the *anal canal*.

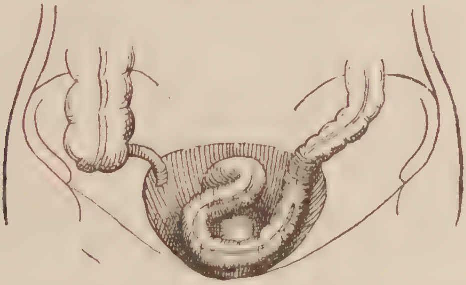


FIG. 7. Cæcum, iliac colon, pelvic colon and rectum.

As will be described later, the whole of the large intestine below the splenic flexure is emptied by defæcation. Fæces already in the ascending colon and transverse colon and the chyme, arriving there later in the day from the stomach and small intestine, pass slowly on through the descending colon till they reach the pelvi-rectal flexure, formed by junction of the pelvic colon with the rectum. Owing to the tonic contraction of the latter and the acute angle formed where the two parts meet, a definite obstruction to the onward passage of the fæces is here produced, so that, as O'Beirne was the first to show, none enters the rectum, which is normally empty until immediately before defæcation, except for the very small quantity of fæces which is sometimes left in the ampulla after defæcation. The pelvic colon fills from below upwards; if the bowels are opened regularly and completely every morning no accumulation occurs elsewhere, but otherwise the iliac and the descending colon become progressively filled when the pelvic colon can contain no more fæces. O'Beirne was led to the discovery of the different functions of the pelvic colon and rectum by passing a tube through the anus at various times of the day in normal individuals. He found that after the initial

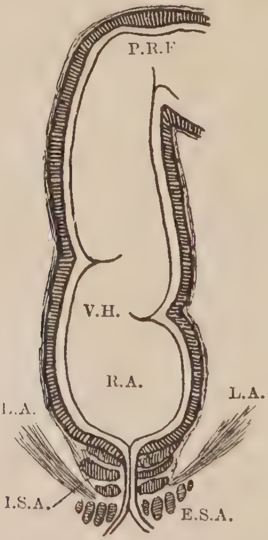


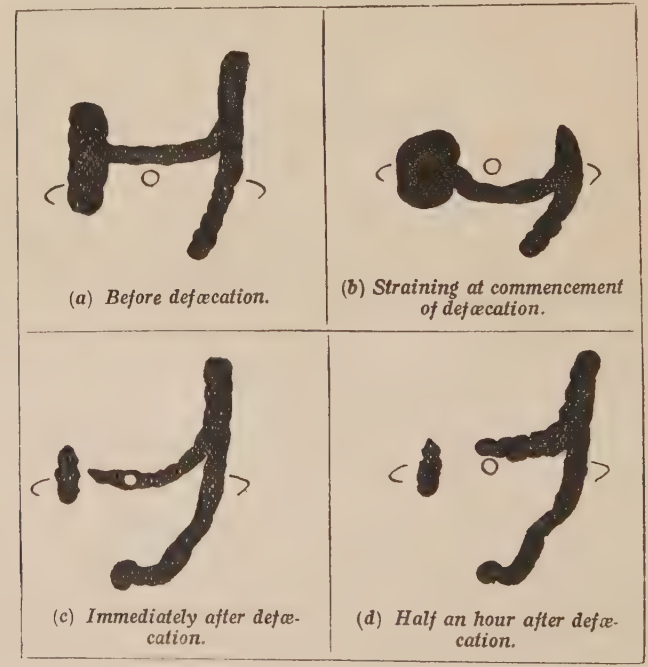
FIG. 8. Diagram of the pelvi-rectal flexure, rectum and anal canal. P.R.F., Pelvi-rectal flexure; V.H., Lowest valve of Houston; R.A., Rectal ampulla; L.A., Levator ani; I.S.A., Internal sphincter ani; E.S.A., External sphincter ani.

resistance felt in the anal canal the tube reached the ampulla of the rectum, in which it could be freely moved, but that nothing escaped from it. Some resistance was felt in the passage through the rest of the rectum, and this reached its maximum at the junction with the pelvic colon. Here it passed suddenly ' as if through a ring, more or less tight, into a space in which its extremity could be moved with great freedom ; and as instantly a rush of flatus, of fluid fæces, or of both, took place through the tube '. When this did not occur, the tube was felt to have ' entered a solid mass in the flexure ', and ' the instrument, on being withdrawn, exhibited a few inches of its upper extremity covered, and its eyes plugged up, with solid excrement '. The observations of O'Beirne can readily be confirmed by palpation or by means of the sigmoidoscope.

As the pelvic colon becomes distended it rises, so that the angle it forms with the rectum ceases to be acute and the obstruction to the passage of fæces into the rectum is diminished (cf. Fig. 7 with Fig. 2). The sensation of fulness in the rectum or weight in the perineum, which leads to the desire to defæcate and which may be termed the ' call to defæcation ', is brought about by the entry into the rectum of some of the fæces which have accumulated in the pelvic colon during the previous twenty-four hours. In individuals, whose bowels are opened regularly every morning after breakfast, the entry of fæces into the rectum is the result of active peristalsis of the colon, brought about—generally reflexly—by various stimuli, the chief of which is the entry of the food taken at breakfast into the empty stomach. The same effect is probably produced by a cold bath, by the muscular activity involved in getting up and dressing, by drinking a glass of cold water before breakfast, and by smoking a cigar. The latter appears to act by means of the nicotine it contains, as the alkaloid paralyses the peripheral symphathetic ganglia, so that the tonic inhibition exerted by the splanchnic nerves on intestinal activity is diminished.

If no desire to defæcate is felt at the proper time, voluntary contraction of the abdominal muscles and diaphragm may force some fæces into the rectum, the call to defæcation being thus voluntarily produced.

The call to defæcation having occurred as a result of the entry of a small quantity of fæces into the rectum, the act itself is started by the increase in intra-abdominal pressure, brought about voluntarily by the simultaneous contraction of the muscles of the abdominal wall and the diaphragm. The relatively small size of the levator ani muscles and the very limited excursion they are capable of making on contraction prevent them from materially diminishing the volume of the abdomino-pelvic cavity, so that they do not take any active part in increasing the intra-abdominal pressure. But as a result of their normal tone, they offer a firm resistance to pressure from above and allow the other voluntary muscles of defæcation to create the necessary rise in intra-abdominal pressure. The abdominal


(*a*) *Before defæcation.*

(*b*) *Straining at commencement of defæcation.*

(*c*) *Immediately after defæcation.*

(*d*) *Half an hour after defæcation.*

Fig. 9. Normal defæcation.

muscles also act more by offering a firm resistance than by actually diminishing the capacity of the abdominal cavity, the chief factor in bringing about the latter being the contraction of the diaphragm, which is maintained in its dependent position by the closure of the glottis at the end of inspiration. By means of the X-rays we were able to see the diaphragm move down to the lowest position it could possibly attain, where it remained with slight variations during the straining which resulted in defæcation. The transverse colon and the hepatic and splenic flexures were depressed to exactly the same extent as the diaphragm, and as the lower border of the cæcum only descended about half an inch, the ascending colon was compressed to an almost globular form (Fig. 9 *b*). After the straining ceased, the ascending and descending colon rapidly returned to their normal position, but the transverse colon rose more slowly and sometimes did not return to its original height until an hour or more had elapsed (Fig. 10). The flexion of the spine, with the resulting approximation of the sternum to the pubes, and the pressure of the thighs on the abdominal wall, when the natural but unusual crouching position is assumed, further increase the pressure within the abdomen.

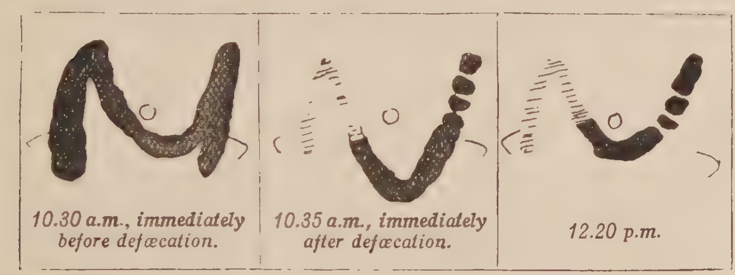

10.30 a.m., immediately before defæcation.
10.35 a.m., immediately after defæcation.
12.20 p.m.

FIG. 10. Normal defæcation.

In a normal resting individual the pressure in the rectum in the erect posture is about 25 mm. of mercury. About 10 mm. of this is due to the tonic contraction of the diaphragm and abdominal walls, as the pressure within the stomach under these conditions is 10 mm. The remaining 15 mm. is due to the weight of the abdominal contents.

On straining in defæcation, the intra-abdominal pressure measured in the rectum rises to between 100 and 200 mm. of mercury (Keith [3]).

The increased intra-abdominal pressure causes more fæces to enter the rectum, which becomes distended, and some may be forced into the anal canal, which is normally quite empty. Both the distension of the rectum and the irritation of the lining membrane of the anal canal by fæces give rise to afferent nervous impulses, which pass to a centre in the lumbar spinal cord ; they there set in action the efferent impulses, upon which depends the reflex act required to complete the process of defæcation. This consists in strong peristaltic contractions of the colon, contraction of the voluntary muscles enclosing the abdominal cavity and relaxation of both anal sphincters. Though the whole process may be entirely involuntary, under normal conditions it is assisted by the voluntary contraction of the diaphragm and abdominal muscles and by voluntary relaxation of the external anal sphincter. It is generally believed that the strong peristalsis of the colon which occurs in defæcation is limited to the parts below the splenic flexure, but our observations lead to the conclusion that the cæcum, ascending colon and transverse colon are also active. Thus on the occasion on which we watched the actual process of defæcation, active peristaltic contractions appeared to occur in all parts of the large intestine, including the cæcum and ascending colon. Equally conclusive evidence was obtained by comparing the tracings obtained immediately before and immediately after defæcation, as shown, for example, in Figs. 9 and 10. The shadow of the cæcum, ascending colon and a small part of the transverse colon became thinner and fainter owing to the passage of their contents further along the colon.

The fæcal mass is forced through the relaxed anal canal by the simultaneous contraction of the gut and the raised intra-abdominal pressure. The tonic contraction of the levator ani muscle is sufficient to direct the fæces, which are driven towards the coccyx, in a forward direction towards the entrance to the anal canal. The final expulsion of the fæcal mass from the rectum is helped by the voluntary action of the levator ani muscles, which draw the anal canal upwards over it, as it is forced downwards through the relaxed sphincter ; finally they clear out the last trace of fæces by contracting tightly behind them, so as to constrict the bottom of the rectum.

According to Gant,[4] an important factor in the propulsion of fæces through the rectum is a progressive invagination of the pelvic colon into the rectum, 'which acts like a piston and drives the fæces before it, similar to the act as seen in a horse.' He has watched this occur with a sigmoidoscope inserted into the rectum of a patient, who was instructed to strain as if at stool. Gant believes that all coats of the pelvic colon take part in this process, but it seems very improbable that anything more than the mucous membrane is invaginated.

The defæcation reflex can sometimes, especially in children, be artificially excited by making a rough rectal examination, by the simple introduction of a chemically indifferent suppository, or with more certainty by the introduction of such substances as glycerine, which act as chemical irritants to the rectal mucous membrane.

In most cases the shadow of the whole of the large intestine below the splenic flexure disappears during defæcation (as in Fig. 10), showing that this part is completely emptied. In the case illustrated by Fig. 9 the descending, the iliac and part of the pelvic colon were still seen after defæcation, as only a few small scybala were passed, in spite of the active peristalsis, which almost emptied the cæcum and ascending colon. This was no doubt due to the fact that the individual put off defæcation for twelve hours after the desire was first felt, in order that we might be able to observe the act. During this period water must have been absorbed from the fæces in the rectum ; the reflex caused by the introduction of more fæces into the rectum by the voluntary contraction of the abdominal muscles and the diaphragm, at a time when the desire to defæcate was no longer felt, was insufficiently active to enable any part except the rectum to rid itself completely of the hard fæces it contained.

Langley and Anderson[5] have shown that the rectum receives a similar double nerve-supply to that of the colon (Fig. 4). The lower lumbar nerves contain fibres which pass through the sympathetic chain to the inferior mesenteric ganglia, where they are connected with nerve-cells, from which fibres pass in the colonic nerves to the colon and in the hypogastric nerves to the rectum and internal sphincter ani. In addition fibres leave the conus terminalis chiefly by the third sacral nerve root, and pass by the pelvic nerves (or nervi erigentes) to the colon and the internal sphincter, in the immediate neighbourhood of which is situated the inferior hæmorrhoidal plexus, in which they have their ganglion cells. The exact functions of the double nerve-supply is not known, as in animals the result of stimulation of both the lumbar and the pelvic nerves is generally the same, contraction of the rectum and inhibition of the internal sphincter occurring. The fourth sacral nerve supplies the voluntary external sphincter ani and the levator ani muscles, and its stimulation results in their contraction.

The exact nature of the nervous control of defæcation is not yet fully understood. The experiments of Goltz and Ewald[6] on dogs, from which the lower end of the spinal cord had been removed, and the recent observations by L. R. Müller[7] and by Bálint and Benedict[8] on human beings with disease or injury of the spinal cord, have made it necessary to modify considerably the views which had been previously held on the subject. The external sphincter ani, being a voluntary muscle, receives its nerve-supply by fibres, which come from cells situated in the grey matter of the conus terminalis; the latter is therefore the centre for the reflex contraction of the sphincter, which occurs when the anus is irritated. If the spinal cord is cut in animals or diseased or injured in man anywhere above the lumbar region, the tone and reflex contraction of the sphincter are unaffected or only temporarily impaired, but it is no longer possible by an effort of will to contract the muscle and prevent the escape of fæces, when the rectum is getting rid of its contents. If, on the other hand, the lowest segment of the spinal cord is destroyed by injury or disease, the external sphincter becomes completely relaxed and no longer contracts when the anus is irritated.

The musculature of the colon and rectum and the internal sphincter ani are composed of involuntary muscle-fibres, and their nerve-supply originates from ganglion-cells of peripheral nerve-plexuses and not from cells in the spinal cord. It is probable that these ganglion-cells form the centre for the reflex defæcation, which occurs when the rectum is distended or irritated. For disease or injury to the spinal cord produces no more disturbance in defæcation when it is situated in the conus terminalis than when it is above the upper lumbar region. In both conditions the voluntary impulses from the brain, which can normally assist or inhibit the reflex act of defæcation, are cut off, and the rectum is, of course, completely anæsthetic. Hence when fæces accumulate in the rectum or are expelled from the anus no sensation is produced. But the reflex act of defæcation remains intact, and in spite of the patulous condition of the external sphincter, when its spinal centre is destroyed, fæces do not continually escape from it, but are expelled periodically whenever the distension of the rectum calls forth the defæcation reflex, just as when the lesion is higher in the cord.

When defæcation ceases to be under the control of the will, more or less constipation always results, as the patient does not feel the sensation of discomfort in the rectum, which normally occurs as soon as a small quantity of fæces has entered it from the pelvic colon. Under these pathological conditions, the voluntary acts which this sensation normally calls forth do not occur, so that a considerable quantity of fæcal matter slowly collects in the rectum, where it becomes dry and hard from absorption of water before the reflex is excited. The reflex is then generally insufficiently strong to expel the hard masses of retained fæces, so that cumulative constipation tends to occur. In order to avoid this, purgatives are often given, with the result that fluid fæces reach the rectum. If this occurs in cases in which the conus terminalis is diseased, genuine fæcal incontinence results, as the tone of the external sphincter, which should prevent the escape of the rectal contents, is absent.

It is probable that the old doctrine of a defæcation centre in the conus terminalis is to some extent correct, as the complete reflex includes the contraction of the abdominal and levator ani muscles and the relaxation of the external sphincter, these being voluntary muscles which are under the control of nerve-cells in the spinal cord and not in the peripheral plexuses. Hence the peripheral reflex, which occurs when the conus terminalis is thrown out of action, is incomplete, although the abdominal muscles and diaphragm may still help in defæcation as a result of an effort of will. It is probable that the hæmorrhoidal plexus normally acts as a subordinate centre for defæcation, which is under the control of the centre in the conus terminalis, and this is in turn governed by exciting and inhibitory influences, which reach it from the brain by way of the spinal cord.

When the inclination to defæcate is resisted, the desire soon passes away, and often does not occur again until the next regular period for opening the bowels. The disappearance of the desire led O'Beirne to believe that reverse peristalsis occurred and carried the fæces from the rectum into the pelvic colon again. This theory has been generally accepted, but Tuttle [9] believes it to be untrue, as he found that pledgets of cotton coated with vaseline introduced into the rectum did not move until the next action of the bowels, which might not occur until twenty-four hours later. Moreover, if defæcation is voluntarily inhibited, a digital examination made even several hours later, when the desire to defæcate has disappeared, shows that the rectum still contains fæces. It is this voluntary inhibition of defæcation, with the consequent retention of fæces in the rectum, which leads, as will be described in detail in a later chapter, to the blunting of the sensibility of the rectum—one of the most important factors in the production of a common variety of constipation.

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[1] W. B. Cannon: *Amer. Journ. of Phys.*, vi, 264, 1902.

[2] Byron Robinson, quoted by S. G. Gant: *Constipation and Intestinal Obstruction*, p. 23. Philadelphia, 1909.

[3] A. Keith: *Visceroptosis*, in Allbutt and Rolleston's *System of Medicine*, iii, 860, second edition, 1907.

[4] S. G. Gant: *Constipation and Intestinal Obstruction*, p. 23. Philadelphia, 1909.

[5] J. N. Langley and H. K. Anderson: *Journ. of Phys.*, xviii, 67, 1895.

[6] F. Goltz and J. R. Ewald: *Pflügers Arch.*, lxiii, 362, 1896.

[7] L. R. Müller: *Deutsche Zeitsch. f. Nervenheilkunde*, xiv, 1, 1899, and xix, 303, 1901.

[8] R. Bálint and H. Benedict: *Deutsche Zeitsch. f. Nervenheilk.*, xxx, 1, 1906.

[9] J. P. Tuttle: *Diseases of the Anus and Pelvic Colon*, p. 523. London, 1903.

CHAPTER VII

THE COMPOSITION AND FORMATION OF FÆCES

James Copland,[1] in 1858, was the first to suggest that only a comparatively small proportion of the fæces is derived directly from the food. In starvation a very small quantity of fæces is still excreted, and it closely resembles what is formed on a cellulose-free diet. Voit[2] and Hermann[3] showed independently that, if a loop of intestine was washed and isolated from the rest of the guts, after some days it contained material, which was identical in consistency, appearance and chemical composition with fæces. The fæcal material in starvation and in isolated intestinal loops can obviously contain no food residue; it consists of intestinal juice, desquamated cells from the intestinal epithelium and bacteria. Very little bile and pancreatic juice are found in the fæces, as they are almost completely reabsorbed, except hydrobilirubin, lecithin and the products of decomposition of bile salts and cholesterin. The intestinal secretion is increased in quantity when food is taken, even if this be free from cellulose. This is due partly to the mechanical stimulation of the mucous membrane, partly to the chemical stimulation produced by sugar and peptone, but mainly to the flow of pancreatic juice to which food gives rise, as the pancreatic juice is the most important stimulant to the secretion of *succus entericus* (Pawlow). Thus Rieder found that more fæces and a larger quantity of nitrogen were excreted by a dog on a diet containing starch, sugar and fat, but no protein or cellulose, than in starvation. The addition of protein to such a diet makes very little difference, as the fæces contain little or no food residue unless cellulose is present, only about 1 per cent. of the actual nitrogen of the food being present in the fæces. Thus no soluble carbohydrate or protein, and no muscle fibres, connective tissue or nuclein are present, and the quantity, the heat value and the chemical composition of the fæces are almost constant, whether the cellulose-free diet consists mainly of protein, of carbohydrate or of fat.

The addition of cellulose to the diet not only causes some food residue to be excreted, but it also increases the other constituents of the fæces. The mechanical stimulation of the mucous membrane leads to increased secretion and also to increased peristalsis, which causes a diminution in the reabsorption of the intestinal juice. The bacterial decomposition of carbohydrates, the digestion and absorption of which higher up in the intestine are diminished by the cellulose, produces substances, which further increase the amount of intestinal juice in the fæces by chemically stimulating secretion and peristalsis. Finally the presence of a larger food residue and of more intestinal juice favours the development of bacteria, which further add to the bulk of the fæces.

Woodward[4] in 1879 was led to suggest from the microscopical appearance of fæces that bacteria formed a considerable proportion of their bulk. This view was not widely accepted, as it was found that the number of cultures of living organisms, which could be grown from fæces, was not as large as would be expected, if Woodward's suggestion were correct. Strasburger,[5] however, in 1902, showed that the result of the culture investigations was due to the fact that the vast majority of the bacteria in the fæces are dead. He devised a method by means of which the bacteria, both dead and living, can be separated from the fæces. On centrifugalizing a mixture of fæces and water, the bacteria remain in suspension and all the other solid constituents collect at the bottom. The fluid is poured off and its specific gravity is lowered by the addition of alcohol. On centrifugalizing again, the bacteria collect at the bottom, so that they can be separated and weighed. In three normal individuals on a mixed diet Strasburger found that an average of one-third of the weight of dried fæces consisted of bacteria. A smaller proportion—about one-fifth—was found by Steele [6] in four healthy individuals, the difference being due probably tȯ the difference between the German and American diets. Even in starvation and in isolated intestinal loops a good deal of the fæcal material consists of bacteria, but the proportion increases with each addition to the diet.

The average weight of dried bacteria excreted daily is 8 grammes, and the amount of nitrogen they contain is about 0·8 gramme, or one-half of the total quantity in the fæces. Strasburger estimated that about 128,000,000,000,000 bacteria are evacuated in the fæces every day.

When cellulose is absent from the diet, the fæces contain between 65 and 75 per cent. of water. The dried fæces contain about 7 per cent. nitrogen and about 15 per cent. each of substances soluble in ether and of ash, which consists mainly of calcium phosphate, with traces of iron and magnesium. Lecithin, fatty acids and soaps, and a very small quantity of neutral fat, are present in the ethereal extract, but the largest part is of unknown composition. The fæces contain a small quantity of nucleo-protein and mucin, but no protein, so that most of the nitrogen, like most of the ethereal extract, remains unaccounted for. The occurrence of an enormous number of bacteria in the fæces partly explains the incompleteness of our knowledge of its chemical composition, as they probably supply the largest part of the ethereal extract and about half of the nitrogen.

When cellulose is present in the diet, more or less residue of the food is found in the fæces in addition to the intestinal juice, desquamated epithelial cells and bacteria. Cellulose is the only important constituent of the food, which is unaffected by any digestive juices, although from 5 to 50 per cent. of it undergoes bacterial decomposition, the amount depending mainly on the method of preparation of the food. Hence a considerable proportion of the cellulose appears in the fæces. On shaking the stools of a vegetarian with water, large quantities of almost unaltered fragments of vegetables and fruit, as well as microscopical starch-granules, and vegetable-cells and fibres are found.

Cellulose has, moreover, the important effect of interfering with the absorption of proteins, as the digestive juices have difficulty in penetrating the cellulose membranes of vegetable-cells, so that their contents in part escape digestion. Thus Rubner has shown that in the absence of cellulose from the food almost everything is absorbed, whatever variations are made in the diet, whereas Voit found that 3·5 out of 8·4 grammes (42 per cent.) of nitrogen present in the food of a vegetarian were lost in the fæces, and that after the individual had lived many years on the same diet no larger proportion was absorbed. This is due solely to the cellulose present and not to any difference in the digestibility of animal and vegetable proteins, as if vegetable proteins are extracted and given without cellulose they are as completely absorbed as animal proteins. The enormous importance of cellulose in determining the amount of absorption of food is shown by the fact that only about 5 per cent. of the dry substance of meat and eggs, which contain no cellulose, and of rice and white bread, which contain very little, appears in the fæces, whereas 15 per cent. of the dry substance of green vegetables and brown bread and 20 per cent. of carrots and turnips are lost.[7] A good deal of carbohydrate is excreted in the fæces on a vegetable diet, but this consists mainly of the cellulose itself, as comparatively little starch and no sugar escape digestion. There is also no increase in the fat present in the fæces when a vegetable diet is given.

The quantity of undigested food in the fæces depends not only on the amount of cellulose, but also on the extent to which it is broken up and softened in its preparation. Thus mashed potato leaves very little residue, but a comparatively large quantity of carbohydrate is lost when the potatoes are simply boiled.

The intestinal contents travel much more rapidly through the colon when the diet contains a large proportion of vegetables than when vegetables are absent. This results in a considerably larger quantity of water escaping absorption with the former than with the latter diet. Hence the quantity of water excreted by the bowel, as well as the weight of dried fæces, increases when a vegetable diet is given. Thus on a mixed diet about 35 grammes of dry substance and 100 grammes of water are daily excreted in the fæces, whereas on a vegetable diet the quantities are 75 grammes and 260 grammes respectively.

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[1] J. Copland: *Dict. of Pract. Med.*, i, 405. London, 1858.

[2] F. Voit: *Zeitsch. f. Biol.*, xxv, 232, 1889.

[3] L. Hermann: *Pflügers Archiv*, xlvi, 93, 1890.

[4] J. V. Woodward: *The Med. and Surg. History of the War of Rebellion*, Part II, vol. i, 278. Washington, 1879.

[5] J. Strasburger: *Zeitsch. f. klin. Med.*, xlvi, 413, 1902.

[6] J. Dutton Steele: *Journ. of Amer. Med. Ass.*, 1908, ii, 647.

[7] M. Rubner: quoted in Nagel's *Handb. der Physiol. des Menschen*, ii, 651. Braunschweig, 1907.

PART II

THE CAUSES OF CONSTIPATION

INTRODUCTION

VARIETIES AND DEFINITION OF CONSTIPATION

THE abnormal action of the bowels in constipation may manifest itself in three different ways: defæcation may occur with insufficient frequency, the stools may be insufficient in quantity, or they may be abnormally hard and dry.

To have one action of the bowels a day is often regarded as the only normal condition, but it is really nothing more than a matter of convenience, being found to suit the habits and diet of the majority of civilized people. It is indeed not very rare to find people in perfect health, who defæcate regularly two or three times a day, and others, who only obtain an evacuation once in two or three days, without suffering the smallest ill effects. A number of cases are on record, in which the bowels were regularly opened at still longer intervals without detriment to health. A lady, who looked the picture of health, told Goodhart[1] that her bowels acted regularly, but when he asked for details, the regularity turned out to be once every eight days. Goodhart also mentions the case of a gentleman, aged seventy-seven years, who for nineteen years obtained a fortnightly evacuation by taking a pill on alternate Saturday nights. Heberden[2] relates that among his patients 'one man never went but once in a month: another had twelve stools every day for thirty years, and afterwards seven in a day for seven years, and in the meantime did not fall away, but rather grew fat'. As Burne[3] has pointed out, in some such cases increased frequency makes the patient feel unwell, and is often the sign of the onset of severe illness. Thus Dr. C. J. Morton tells me that, when he was working in an Edinburgh dispensary, a number of old women, who came to him with various complaints, had their bowels opened only once every four or five weeks; they were furious when their bowels acted before the expected time as a result of the purgative he had prescribed.

Such individuals, so long as defæcation, when it does occur, is complete, can be no more regarded as diseased than those otherwise normal people, whose hearts beat at the rate of only forty or fifty times a minute. The majority, however, although they may suffer no inconvenience for a considerable time, finally develop symptoms due to fæcal accumulation, as defæcation is generally incomplete as well as infrequent, so that gradually increasing quantities of fæces are retained. For practical purposes, therefore, an individual may be considered constipated, if his bowels are not opened at least once in every forty-eight hours.

A less frequently recognized variety of constipation is that described by Field[4] as 'cumulative constipation', in which insufficient fæces are excreted, although the bowels may be opened every day. It is impossible to say exactly how much fæces should be formed in twenty-four hours, as even with the same diet different individuals normally excrete different quantities. This is due to variations in the quantity of intestinal juice secreted as well as in the proportion of food absorbed. Trousseau [5] realized this when he wrote that 'you do not say that a man is in a state of disease because he perspires very little; and you have no more right to say so, because his digestive apparatus is in an analogous condition'. But it is very important to recognize that a condition of constipation may exist which, as Cruveilhier [6] wrote half a century ago, is analogous to retention of urine with overflow. In normal defæcation the contents of the large intestine beyond the splenic flexure are completely evacuated. If, however, only a small quantity of fæces from the rectum or pelvic colon is excreted once or even several times a day, each day a certain quantity is retained, and cumulative constipation results.

Thus Nothnagel [7] records the case of 'a public official, who asserted most positively that he had always made a point of having a daily evacuation of the bowels, and yet he died of peritonitis following a perforation caused by a large number of enormous fæcal masses as hard as stone occupying the intestine '. In other cases no symptoms may arise, but large fæcal tumours may form. In a patient of Ewald's,[8] whose bowels were opened daily and who had no symptoms, a tumour the size of a child's head was found low down in the abdomen, and the rectum was full of stony hard fæcal masses. The latter were mechanically removed, and the colon was washed out after castor oil had been given, with the result that the tumour entirely disappeared. Ewald also refers to a case recorded by Lasègue of a man, whose bowels were quite regular and who had no vomiting or pyrexia. His abdomen, however, was painful and distended, until one night, ten months after the onset of the pain, he passed with great pain sufficient fæces to fill seventeen chamber-pots, after which he was quite well.

The 'fragmentary constipation' described by Boas [9] is a variety of this cumulative constipation. It occurs particularly in men, and is characterized by a constant sensation of fulness in the rectum, which leads to attempts to defæcate as often as a dozen times in a day, but on each occasion the individual is either entirely unsuccessful, or after great efforts he only gets rid of a small hard fæcal fragment.

Lastly, the amount of fæces formed may be normal and the bowels may be opened daily, yet the fæces are abnormally hard and dry, owing to prolonged retention before excretion. The fæces are generally excreted as very small, hard fragments, dark in colour, and generally smelling less strongly than normal fæces. This is the type of constipation observed in cases of muco-membranous colitis.

The separation of these three varieties of constipation is somewhat artificial, as two or even all of them are often present together. But in most cases one predominates, and it should always be remembered that two of them may occur even when the bowels are opened every day, as otherwise severe cases of fæcal retention may be overlooked. Infrequency of defæcation is the most common form of constipation to be unassociated with the other forms, as it is quite common for the evacuation to be complete in spite of its delay. This may even be the case when defæcation occurs with such extraordinary rarity as in the following case :—

A labourer, aged 26, had been constipated from childhood. When he was 2 years old, a fortnight often elapsed without his bowels being opened. Defæcation became steadily less frequent, until at the age of 22 his bowels were only well opened once or twice a year, when he had an attack of vomiting with violent abdominal pain for two to four days, during which he discharged about forty pounds of fæces. The longest interval between two evacuations was eight months and sixteen days, when the patient was 22 years old. The abdomen when loaded was hard, and 'the immensely distended colon was traceable like a huge sausage' (Strong[10]).

Most continental authorities separate all cases of constipation into two great classes—atonic and spastic. Though a considerable number of cases are due to atony or to spasm of the intestinal muscles, many more are due to neither. The terms atonic and spastic constipation may be correctly applied to certain cases, but they clearly do not help in the classification of constipation as a whole.

A more scientific classification of constipation than those just considered is one which divides all cases into two classes, according to which of the two great physiological processes, which maintain the regular action of the bowels, is deranged. These two processes are, firstly, the passage of the residue of the food from the stomach to the pelvic colon, and, secondly, the complete evacuation of the pelvic colon at proper intervals.

In the first class of constipation the passage through the intestines is delayed, whilst defæcation is normal, and in the second class there is no delay in the arrival of the fæces in the pelvic colon, but their final excretion is not adequately performed. I have adopted the word *dyschezia*, which was used by Robert Barnes[11] to denote painful evacuation of fæces, in order to describe the second form of constipation, which is the result of inefficient defæcation. The two classes of constipation may of course exist in the same patient, but in the vast majority of cases one is much more prominent than the other and alone requires treatment.

In the chapter on the physiology of the intestinal movements it was shown that on an average nine hours are required for the residue of a meal to reach the splenic flexure, and that in defæcation all the contents of the large intestine beyond the splenic flexure are excreted. If the greatest period, which can normally elapse after a meal before the splenic flexure is reached, is sixteen hours, some of the residue of a meal taken eight hours after defæcation should be excreted at the next defæcation in individuals, whose bowels are opened punctually every twenty-four hours. If, however, the bowels are only opened on alternate mornings—a condition which is not necessarily pathological—forty-eight hours would elapse instead of sixteen before some of the residue of the meal would be excreted.

Constipation may therefore be defined as *a condition, in which none of the residue of a meal, taken eight hours after defæcation, is excreted within forty hours.*

This definition embraces the clinical varieties of constipation, in which defæcation occurs with insufficient frequency and in which the stools are insufficient in quantity or are abnormally hard and dry, and the pathogenetic classes, in which the passage through the intestines is slow and in which defæcation is inefficient.

In doubtful cases constipation of any sort can, according to this definition, be recognized by giving two or three charcoal lozenges with some food eight hours after defæcation, and observing after what interval black fæces are passed. Thus in an individual whose bowels were opened at 8 a.m., charcoal should be given at 4 p.m. the same day. If some of the charcoal is not passed at latest the second morning after it was taken, the patient should be regarded as constipated.

Examination with the X-rays is the only method, with which it is possible to separate with absolute certainty cases of constipation due to the slow passage of fæces through the intestines from dyschezia. Two ounces of bismuth oxychloride * mixed with bread and milk are taken at breakfast, and observations are made at intervals during the next two or three days of the shadow produced on the fluorescent screen, when the patient is examined with the X-rays. It is advisable to empty the large intestine completely by means of enemata on the previous day and on the morning of the first examination. Otherwise a delay may be observed in some part of the intestine, which is due merely to the mechanical obstacle offered by the accumulated fæces. During the period of observation the patient should be allowed to carry on as nearly as possible his usual occupations and to take an ordinary mixed diet.

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* *Vide* Appendix.

In all cases of chronic constipation an abdominal and rectal examination should be made. It is important that no medicine or enemata should have been taken on the day of the examination, as it is necessary to find out whether there is any palpable accumulation of fæces in any part of the large intestine after an attempt has been made to open the bowels without artificial assistance. Thus if more than a very small quantity of fæces is found in the rectum at any period except immediately before defæcation, dyschezia may be diagnosed. On the other hand, if the rectum is almost or quite empty, the constipation must be due to delay in the passage through the intestines, except in the somewhat rare cases of dyschezia, in which there is inability to pass fæces from the pelvic colon into the rectum.

[1] J. F. Goodhart: *Lancet*, 1902, ii, 1241.

[2] W. Heberden: *Commentaries on the History and Cure of Diseases*, p. 14, fourth edition, London, 1816.

[3] J. Burne: *A Treatise on the Causes and Consequences of Habitual Constipation.* London, 1840.

[4] H. M. Field: *Boston Med. and Surg. Journ.*, cxxi, 537, 1889.

[5] A. Trousseau: *Lectures on Clinical Medicine.* Eng. Trans., iv, 184, 1871.

[6] J. Cruveilhier: *Traité d'anatomie pathologique*, ii, 868. Paris, 1852.

[7] H. Nothnagel: *Diseases of the Intestines.* Eng. Trans., p. 97, 1906.

[8] C. A. Ewald: *Klinik der Verdauungskrankheiten*, iii, 104. Berlin, 1902.

[9] I. Boas: *Diagnostik u. Therapie der Darmkrankheiten*, p. 252. Leipzig, 1901.

[10] T. D. Strong: *Amer. Journ. of the Med. Sciences*, lxviii, 440, 1874.

[11] Robert Barnes: *Diseases of Women*, p. 145, second edition, London, 1878.

CLASS I

CONSTIPATION DUE TO THE SLOW PASSAGE OF FÆCES THROUGH THE INTESTINES

DELAY in the passage of fæces through the intestines is due to (A) the motor activity of the intestines being deficient, or (B) the force required to carry the fæces to the pelvic colon being excessive. Apart from organic obstruction, the delay in either case is generally confined to the large intestine beyond some point distal to the hepatic flexure, this being the situation where the intestinal contents begin to be more or less solid, so that additional force is required for their propulsion. Moreover, an increasing resistance is offered to the progress of the intestinal contents as they pass towards the pelvic colon, because the lumen of the cæcum and ascending colon is much greater than that of the transverse colon, and the latter diminishes in size as it approaches the splenic flexure, the diameter of the descending colon being smaller than that of any other part of the large intestine. Corresponding with the greater force required to carry the fæces along the distal parts of the large intestine, the thickness of the muscular coat of the empty gut is greater in the descending and pelvic colon than in the transverse colon, and greater in the latter than in the cæcum and ascending colon (Roith [1]). Under certain conditions, however, in spite of this compensatory mechanism, the musculature of the peripheral part of the colon is unable to perform its functions in an adequate manner.

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[1] O. Roith: *Mitteil. aus d. Grenzgeb. d. Med. u. Chir.*, xix, 33, 1908.

SECTION A

DELAY IN THE PASSAGE OF FÆCES THROUGH THE INTESTINES FROM DEFICIENT MOTOR ACTIVITY

THE motor activity of the colon may be deficient owing to (1) weakness of the musculature, (2) diminished reflex activity, and (3) inhibition or (4) uncontrolled and irregular action.

CHAPTER I

WEAKNESS OF THE INTESTINAL MUSCULATURE (ATONIC CONSTIPATION)

(*a*) **Constitutional constipation.**—It occasionally happens that several members of a family suffer from constipation from infancy. In some such cases the family tendency to constipation is the result of neglecting to educate the children in regular habits or of injudiciously dosing them with purgatives. In other cases a tendency to neurasthenia is inherited and this is the cause of the constipation. Sometimes there is a family predisposition to constipation quite apart from these causes, but more frequently 'constitutional constipation' is sporadic, a single member of a family being constipated from birth without any ascertainable cause. In such cases the early onset of the trouble and its persistence in spite of regular habits and a proper diet suggest that it is due to some inherited abnormality, such as an abnormally long pelvic colon or a congenital hypoplasia of the intestinal musculature. Nothnagel[1] discovered in a number of individuals, who had always been healthy except for habitual constipation, and who had died from some intercurrent acute illness, that the muscular coat of their intestines was not more than half the normal thickness, although their skeletal muscles were well developed. Thus a man, aged 21, who had always been constipated, died on the fourteenth day of an attack of typhoid fever. At the autopsy it was found that the thickness of the muscular coat of the colon was about 0·25 mm. instead of the normal 0·6 to 1·0 mm., although all the other muscles of his body were well developed and atrophy of the intestinal musculature never occurs simply as a result of typhoid fever.

Case 1. *Constitutional constipation with delay in the small intestine as well as the colon.*—A lady, aged 35, seen with Mr. H. B. Butler of Guildford, had been constipated as long as she could remember. Since an attack of diarrhœa, which she had whilst abroad seven months ago, she had only been able to get her bowels open three or four times a week with the aid of enemata, purgatives having recently ceased to have any effect. Her appendix was removed some months ago, but it was not obviously diseased. When first examined, the rectum was found to be empty, although the bowels had not been opened for twenty-four hours; and the patient still experienced a normal desire to defæcate when the rectum filled, so that dyschezia could be excluded. The descending and the iliac colon were found by abdominal palpation to be filled with fæces and the pelvic colon was felt through the front wall of the rectum to be in the same condition. Mr. Butler observed that no cæcal sounds could be heard four hours after breakfast; this patient was the only one among some twenty he had examined, who were not suffering from any acute abdominal condition, in whom this sign of delay in the passage through the small intestine was found. Examination with the X-rays, after the colon had been completely evacuated by large enemata given under low pressure from a douche-can on three consecutive days, confirmed this observation, no trace of a shadow being present in the cæcum four and three quarter hours after a bismuth breakfast. Eight and a half hours after the meal the cæcum and most of the ascending colon were visible; the next morning, the bowels not having been opened, most of the bismuth was still in the cæcum and ascending colon, but traces were seen scattered through the transverse colon and the first part of the descending colon.

Thus in this case there was well-marked delay in the small intestine as well as in the colon. As the patient took an ordinary mixed diet and a fair amount of exercise, there was no obvious cause for the slow passage through the intestines. The constipation dated from early childhood, so it is probably an example of constitutional constipation, and may, perhaps, have an anatomical basis in a congenital hypoplasia of the intestinal musculature. If this is present in the small as well as the large intestine, it would account for the delay in the arrival in the cæcum, which is an uncommon occurrence in individuals taking an ordinary mixed diet.

The large accumulation of fæces in the distal part of the intestines accounted for the recent failure of purgatives and the comparative success of enemata, which were always capable of removing a little of the most advanced part of the accumulation. Now that the whole accumulation had been removed, it was thought that by increasing the stimulation of the small and large intestines by a specially stimulating diet and by 'auto-massage' the activity of the bowels would become normal. At the same time a pill containing aloes and nux vomica was ordered, but it was hoped that the dose could be slowly diminished until perhaps drugs could be completely discarded. High enemata were only to be used if the bowels had not been open for forty-eight hours in spite of a daily attempt to defæcate.

(*b*) **Senile constipation.**—People, whose bowels have always been regular, frequently become constipated as they approach old age. In the Clinique des Vieillards at Nancy, Stroup[2] found that 23 per cent. of 134 men and 39 per cent. of 96 women over sixty years old suffered from chronic constipation of more or less recent onset. The average age at which this senile constipation began was 73 in men and 66 in women; it was rarely severe in men, but in women it often became rapidly worse until in some cases the bowels only opened once every five, ten or even fifteen days. Stroup found that twenty-nine out of his sixty-seven patients with senile constipation had no symptoms, which could be referred to it. Only when an evacuation did not occur for three or more days was there, as a rule, any discomfort, and this was generally at once relieved when the bowels were opened. If the constipation was not treated, a hard motion was at length passed, but in fourteen out of sixty-seven patients the period of retention was followed by the passage of three or four liquid stools in one day.

The constipation of old people is due to various causes. The most important is probably atrophy of the intestinal musculature. This was studied by Thibierge[3] in ten autopsies on patients, who died at ages varying between sixty-five and eighty-five from different diseases, and who had suffered in recent years from constipation. They had had no fæcal accumulation in the rectum, so that they were probably true cases of senile constipation and not dyschezia. The mucous membrane was generally atrophied in the small intestine, but in only two cases was there any atrophy in the colon. In all cases, with one exception, the thickness of the muscular coat of the pelvic colon was abnormally small. The individual muscle-fibres were unusually thin,

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but they showed no fatty degeneration. There was well-marked sclerosis of the blood-vessels in all parts of the intestinal wall.

Stroup examined the intestines of fifteen patients, who had died from various causes at ages varying between sixty and eighty-five ; in eleven there was a definite history of constipation. The mucous membrane of the small intestine was always atrophied ; that of the large intestine was atrophied in twelve of the cases. The muscle of the small intestine was always thinner than normal ; that of the colon was only atrophied in nine cases and was actually hypertrophied in two cases. It is not stated whether these colons were obtained from two of the four patients, who had not been constipated. The microscopical changes observed were quite different from those described by Thibierge, as the muscle-fibres were never diminished in size, and in each case groups of fibres in the longitudinal and to a less extent in the circular muscle layer contained minute fat granules. In every case arterio-sclerosis was found, and the bundles of muscle-fibres were broken up by connective tissue, which was present in excess.

Though in detail these accounts do not agree very closely, there seems to be little doubt from them that the muscle-fibres of the intestines degenerate in old age, probably owing to the diminution in their blood-supply, which results from the arterio-sclerosis. This is most probably the main cause of senile constipation. The degeneration of the intestinal mucous membrane, if not a post-mortem change, would probably lead to a diminution in the secretion of intestinal juice, and as this is one of the chief constituents of the fæces, a diminished excretion might be expected. The small quantity and bland character of the food often taken in old age tend to diminish still further the production of fæces.

Defæcation is also probably less efficient in old age than in middle life, as the voluntary muscles which take part in the act share in the general senile atrophy of the muscles of the body, which is due in part to the sedentary life led by most old people. Thus Stroup found fatty degeneration and imperfect striation of the muscle-fibres of the abdominal muscles, the levator ani and the diaphragm of seven people over sixty years old. In old men the enlargement of the prostate may on rare occasions be great enough to impede the expulsion of fæces from the rectum. According to Blake,[4] in old age the coccyx becomes ankylosed, and its end tilts forwards; this leads to obstruction, which he finds can be relieved by firmly pressing the coccyx downwards and backwards.

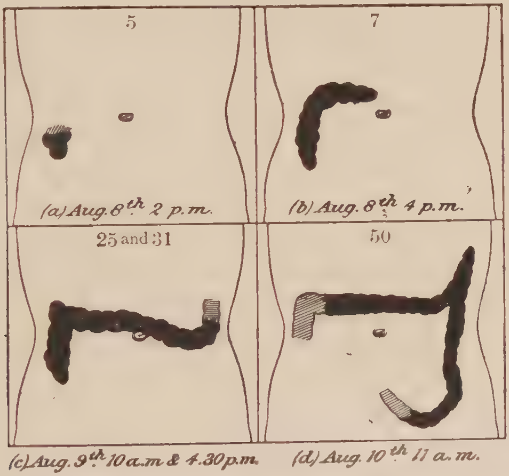

FIG. 11. Constipation due to chlorosis. Bismuth breakfast at 9.15 a.m. on Aug. 8.

(*c*) **Chlorosis.**—In chlorosis the poor condition of the blood leads to inefficiency of the voluntary, cardiac and involuntary muscles. The chief cause of the constipation, which is almost constantly present in chlorosis, is the inefficient condition of the intestinal musculature, but it is often made worse by the use of a diet containing too little stimulating material. The following is one of four cases of chlorosis examined with the X-rays, all of which showed the same type of intestinal delay:—

Case 2. *Constipation associated with chlorosis.*—Florrie G., aged 21, was admitted for chlorosis in July, 1907. She had suffered from indigestion, amenorrhœa, dyspnœa on exertion, œdema of the ankles and a feeling of slackness for five years with occasional intermissions. She had been troubled with constipation for the same period, but with the aid of purgatives her bowels had been opened three or four times a week.

On admission the amount of hæmoglobin present was 42 per cent. of the normal, but the number of red corpuscles was slightly greater than normal, so that the colour index of the blood was about $\frac{1}{3}$. She was given iron and arsenic; her general condition improved steadily and the amount of hæmoglobin rose in a week to 55 per cent. The constipation remained unaltered, and on August 8th aperient pills were discontinued in order that the seat of the delay in the passage of fæces through her intestines might be ascertained (Fig. 11). The cæcum was reached four and a half hours after a bismuth breakfast, and the middle of the transverse colon two hours later, so that up to this point the rate of progress was normal. In the next twenty-four hours, however, an advance of only two or three inches was made, as the following morning the splenic flexure had not yet been reached, and in the afternoon the shadow was unaltered. Not until the second morning after the bismuth breakfast was the pelvic colon reached, the cæcum being then no longer visible and the shadow of the ascending colon very faint. Thus the constipation was due to the sluggish action of the part of the large intestine beyond the middle of the transverse colon, where the force required to move the fæces is greatest.

(*d*) **Cachexia.**—The constipation, which is sometimes an additional source of discomfort to patients suffering from the cachexia of cancer and tuberculosis, has generally been supposed to be due to degenerative changes in the intestinal musculature. Nothnagel, however, could find no evidence of this, even when there was extreme atrophy of the voluntary muscles. The constipation, which is by no means constantly present in cachectic individuals, is largely a result of the unstimulating character and insufficient quantity of the food; it is also perhaps partly due to functional inefficiency of the intestinal musculature, independent of gross anatomical changes. The atrophy of the voluntary muscles must moreover lead to a certain amount of dyschezia.

(*e*) **Rickets.**—Although rickets is more often accompanied by diarrhœa than constipation, it is not uncommonly the starting-point of chronic constipation in children. This is partly due to the frequent distension of the alimentary canal with gas, which increases the work to be done in carrying the intestinal contents onwards, at the same time as it weakens the musculature. The stretched and feeble abdominal muscles also make defæcation difficult.

(*f*) **Fevers.**—Constipation occurs very frequently in acute febrile diseases, and it is not uncommon even in typhoid fever, in which the association with intestinal ulceration might be expected to cause diarrhœa. One cause is undoubtedly the small quantity and bland character of the food generally given to febrile patients. The intestinal juice, which forms an important constituent of the fæces, is diminished in quantity as a result both of the diet and of the fever, which impairs secretory activity. There may also be some disturbance in the functional activity of the intestinal musculature owing to the poisons circulating in the blood and the high temperature of the body, but this is not associated with any anatomical change, the muscles of the intestines being apparently more resistant to such influences than voluntary muscle. After severe and prolonged fevers, such as typhoid fever, Nothnagel found no anatomical change in the intestinal musculature, whereas profound atrophy and degeneration are frequently observed in the skeletal muscles. Bokai[5] has shown that the irritability of the inhibitory nerves to the intestines is increased when the blood is hot, as in fevers ; consequently peristalsis is inhibited to an exaggerated extent by peripheral irritation and by the depressing emotions which are likely to be present in such cases.

Constipation is a frequent event in the convalescence from typhoid fever, and it may be the cause of a slight rise in temperature and even of rigors. In most cases it is relieved by a dose of castor oil or by an enema, but sometimes it remains after convalescence, but rarely, according to Osler,[6] for as long as a year. Constipation may also be troublesome after recovery from cholera or dysentery, quite apart from the production of an intestinal stricture in the latter disease. As the intestines are involved in all these diseases, it is probable that the constipation is due to atony of the musculature, which may result from the changes in the mucous membrane. This is analogous to the constipation, which often follows the diarrhœa of acute enteritis or colitis. The relation of chronic colitis to constipation is more complicated, as the colitis is most frequently a result of the constipation, which it further aggravates. This will be discussed in the chapter on Colitis.

(*g*) **Overdistension of the intestines.**—Intestinal flatulence, which will be discussed more fully in a later chapter, is a cause as well as a result of constipation. The larger the lumen of a muscular tube, the greater is the force required to produce an increase of pressure within it. Hence the muscle of distended intestines has to contract with unusual force in order to maintain the normal rate of progress of the fæces. As the distension diminishes its contractile power, it is often incapable of doing this and constipation results, or, if already present, it is rendered worse.

(*h*) **Obesity.**—The investigations of Nothnagel showed that fatty degeneration rarely occurs in the muscular coat of the intestines. Fatty infiltration, however, is often found in the obese, and it is probable that the constipation of fat people is due in part to the inefficiency of the intestinal musculature, which results from this change. The fatty infiltration is occasionally extreme, and it may be an important factor in the causation of post-operative ileus, as in some cases recorded by Furneaux Jordan.[7] In each instance the patient was excessively fat, and well-marked fatty changes were found in most of the viscera. The intestinal canal was greatly loaded with fat, and in some cases it looked like a ‘ tube of fat ’. In one intestine examined microscopically the muscle-fibres were found to have undergone severe fatty degeneration. The following case of Furneaux Jordan's is particularly interesting, as acute symptoms of intestinal paralysis began spontaneously :—

‘A lady so stout that she had long been confined to her room—the staircase of the house was narrow and awkward—without any previous complaint, began to vomit. The vomit, at first occasional, became incessant and fæcal in character, and she sank in two or three days. . . . The intestinal canal was from end to end enormously distended with gas, but there was nowhere any localized obstruction of any kind. The bowel was strikingly yellow in appearance, and the amount of fat, not only on the body, but within the abdomen, could only be described in words that would savour of caricature. After the most careful examination no other appearance could be found to account for death.'

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[1] H. Nothnagel: *Zeitsch. f. klin. Med.*, iv, 422, 1887.

[2] A. Stroup: *Recherches sur la constipation chez le vieillard.* Thèse de Nancy, 1893.

[3] G. Thibierge: *L'Obstruction intestinale sans obstacle mécanique.* Thèse de Paris, 1884.

[4] E. Blake: *Constipation and some associated Disorders*, second edition, London, 1900.

[5] A. Bokai: *Arch. f. exp. Path. u. Pharm.*, xxiii, 414, 1887.

[6] W. Osler: *Philad. Med. Journ.*, i, 30, 1898.

[7] Furneaux Jordan: *Brit. Med. Journ.*, 1879, i, 621.

CHAPTER II

DEFICIENT REFLEX ACTIVITY OF THE INTESTINES

DEFICIENT intestinal activity is often produced by the insufficiency of the peripheral reflexes upon which it depends. This may be due to (*a*) the stimulation being too weak; or to insufficient excitability of some part of the nervous system, owing to (*b*) structural changes interfering with the afferent impulses, or, much more frequently, to (*c*) a depressed condition of the nervous system.

(*a*) **Insufficient stimulation of intestinal movements.**—Many cases of constipation are the result of insufficient stimulation of intestinal movements. This is most frequently due to (1) too little food being taken, or to (2) the food containing too little mechanical or chemical excitants of intestinal activity; in other cases (3) the absorption of the food is unusually complete. All these conditions are complicated by the fact that, when the intestinal contents at last reach the pelvic colon and rectum, their bulk is so small that they tend to produce an insufficient stimulation of defæcation until the expiration of an abnormally long period, during which further absorption of water takes place, and defæcation is rendered difficult by the hardness and dryness of the stools. (4) Deficient exercise may also lead to constipation by diminishing the stimulation of intestinal activity.

(1) *Insufficient food.*—Morgagni[1] considered that an insufficient supply of food is a common cause of constipation. He quotes the case of Sarpi in support of this opinion: 'as he, when a young man, ate very sparingly, and drank nothing, even for many days, he fell into an obstinate costiveness, in consequence of which, he not only went to stool no more than once in three days generally, but sometimes only once in seven, and, in order to do that, was oblig'd to use such violent strainings, that brought upon him great pains from the piles, and a troublesone prolapsus ani, under which he labour'd for many years.'

A proper supply of food is not only required as a direct stimulus to the intestinal movements, but these are also increased by the thought, sight, smell and taste of food and by the entry of food into the stomach. In complete starvation small quantities of fæces are generally passed every two or three days. The insufficient food taken by the extremely poor, and the small residue, which reaches the intestines in patients, who have organic obstruction of the œsophagus or pylorus or are constantly vomiting from some other cause, produce rather more fæces, but the stools are still very small. The same is true in the case of patients with painful gastric conditions, who take very little food in order to save themselves from the pain which it causes.

A poor appetite is a very common cause of constipation, especially in women. Anorexia is an almost constant symptom of neurasthenia, so that an insufficient amount of food is generally one of the factors in the constipation, which is so frequently present in this condition. The loss of appetite is to some extent the result rather than the cause of the diminution in the quantity of food eaten.

The patient diets himself, because he thinks the dyspepsia, which is often simultaneously present, is due to his inability to digest some special article of food. He gives up one thing after another without obtaining relief, but this voluntary starvation, in which the quantity of food taken is only gradually reduced, always results in a corresponding diminution in appetite. It is in sharp contrast to the effect of acute starvation, such as of necessity occurs after swallowing a caustic poison, as very painful hunger then results. In neurasthenic anorexia, however, the patient subsists on extremely small quantities of food without experiencing any desire for more. As a result the body weight diminishes very considerably, until a point is reached when the reduced weight and the intake of food balance each other, the metabolism being now on a very low plane. Insufficient food leads directly to emaciation and physical weakness as well as to constipation ; it causes the already depressed nervous system to deteriorate still further, and this reacts again on the digestion, so that the gastric dyspepsia and the constipation become more severe. It can be truly said that the number of women who are ill because they eat too little is as great as the number of men who are ill because they eat too much.

Case 3. Constipation due to partial starvation.—A man, aged 35, who was sent to me in September, 1908, by Dr. Peatson of Croydon, had been much worried in his business at the end of 1907. At the same time he began to suffer from diarrhœa, passing a fluid motion after every meal. This appeared to be due to the irritable condition of his nervous system, which led to an exaggeration of the normal reflex stimulation of the intestinal movements produced by the entry of food into the stomach. Under dietetic treatment the diarrhœa ceased, but the patient did not return to ordinary food, with the result that he became constipated. Some rectal hæmorrhage having occurred from piles, these were removed at the beginning of 1908. The patient, being still worried with business and having had his attention directed to his intestines, first by the diarrhœa and later by the hæmorrhoids, could now think of little else, and the constipation was a source of great anxiety to him. He developed the habit of examining his stools and he gave me a most minute description of their size and shape. Thinking that there must be something seriously wrong with his intestines to produce such insufficient motions, he now fed himself only on small quantities of slops, with the natural result that he lost weight and became weaker. The cause of the constipation, which had become progressively severer, was clear enough. His food was so insufficient in quantity and so unirritating in quality that the stimulus to peristalsis and to intestinal secretion became very feeble and the size of the stools very small. On examination, although the patient's bowels had not been opened for some days, I found the rectum empty and the descending and iliac colon tightly contracted, there being clearly no fæcal accumulation in spite of the apparently insufficient amount of fæces excreted. The patient was told that there was no reason for him to worry, as he had no organic disease, and his condition was easily curable ; he was directed to eat a proper amount of a mixed diet. No drugs were given. When seen again in February, 1909, the patient had put on weight and his abdominal symptoms had all disappeared.

(2) *Insufficient mechanical and chemical excitants of intestinal activity.*—A diet which produces insufficient mechanical and chemical stimulation of intestinal activity is perhaps the most common of all the causes of constipation, and especially of the milder forms which are not accompanied by any unpleasant symptoms. This is largely a result of modern methods of preparing food. Savages as a rule merely bruise their grain instead of converting it into a fine powder, and in some cases they mix it with sand or dust before making it into cakes. Civilized people, on the other hand, not only make no addition of indigestible material to the grain, but they also frequently remove the greater part of the cellulose from the wheat, and use only the completely digestible starch for making bread, cakes and pastry. Whole-meal bread, which is the only form which contains all the valuable cellulose of the wheat, is unfortunately eaten in very small quantities compared with white bread.

Vegetables and fruit, which, in addition to cellulose, contain important chemical stimulants of intestinal activity, are generally eaten in sufficient quantity by the richer classes.

Poorer people, however, eat comparatively little vegetables except potatoes, and in recent years the popularity of bananas has increased and the consumption of other fruit has somewhat diminished. Though both potatoes and bananas are among the most valuable of the cheap foods so far as nutrition is concerned, the potato is one of the vegetables poorest in cellulose, and the banana differs from all other fruit in containing a negligible quantity of cellulose. In schools and institutions the importance of green vegetables and fruit is also too often forgotten.

Moreover, in civilized countries the small quantity of indigestible cellulose which is present in the food is generally softened to such an extent by cooking that it loses much of its value as a mechanical stimulant of intestinal activity. It is mainly to their coarse and imperfectly cooked food that savages owe their comparative immunity to constipation, and it is mainly to the badly chosen dietary of the poor and the over-refinement in the cooking of the rich that civilized peoples owe their extreme liability to constipation.

The diet prescribed for certain diseases has the unfortunate defect of leading to constipation. Thus foods containing cellulose are often prohibited to dyspeptic patients; this is generally ill-advised, as the constipation which ensues is likely to exert a bad influence upon the stomach and more than outweigh any good which might be derived from the restriction of diet. In the treatment of gastric ulcer, however, it is absolutely necessary to avoid cellulose, but, as the treatment does not last for more than a few weeks, no permanent harm is done, any discomfort produced by the constipation being relieved at once by enemata. The diet which diabetic patients have to take is one of the main causes of the constipation from which they frequently suffer, although the excess of fat to some extent compensates for the deficiency in carbohydrates. But the enormous benefit gained from the dietetic treatment of diabetes quite outweighs the disadvantage of having to take aperients in order to keep the bowels regular.

Jaundice is sometimes accompanied by constipation;

this has generally been supposed to result from the absence of bile from the intestines, which deprives them of a certain amount of fluid and a mild chemical stimulant to the movements of the large intestine. But Richard Powell[2] more than a century ago pointed out that constipation is by no means constantly present in simple jaundice and that clay-coloured stools are generally soft. Even when constipation occurs with jaundice, Powell believed that it was an accidental association, as ox-gall is rarely able to overcome it, a strong purgative being generally required. Mayo Robson's observations on a case of biliary fistula, which have already been referred to, also showed that the presence of bile is not essential for the regular action of the bowels. The deficiency in bile is probably outweighed by the incomplete digestion of fat to which it gives rise, as this results in the presence in the colon of excess of neutral fat, fatty acids and soaps, all of which stimulate the intestinal movements. It is thus not at all rare to observe diarrhœa instead of constipation in jaundice, and constipation, when it does occur, is probably due more to the limited diet prescribed than to the absence of bile from the intestines.

The following case of constipation due to a diet containing too little stimulating material shows how the sluggish action of both the small intestine and the colon can be cured by the use of a proper diet without any further treatment :—

Case 4. *Constipation produced by an unsuitable diet.*—Sidney H., aged 25, has been constipated from childhood and has always had to use purgatives in order to obtain a regular evacuation. In spite of this, his general health has been excellent, except for occasional attacks of slight abdominal discomfort, most marked in the left iliac fossa. In December, 1907, his appendix was removed, apparently with the object of improving his constipation, as there had never been any symptoms of appendicitis. At the operation adhesions were found in the right iliac fossa and the appendix was kinked, but otherwise it was normal. For the next two months the constipation was better, but since March the trouble has been as bad as ever, the bowels being opened not more than two or three times a week, and then only with the aid of medicine. The patient was admitted into

Guy's Hospital under my care on September 4, 1908. He looked perfectly healthy and nothing abnormal was found in the abdomen, no fæcal accumulation being palpable. The rectum was empty. The muscles of the abdominal wall were well developed. On inquiring into the patient's habits, it was ascertained that his ordinary diet was of a very bland nature, rarely containing green vegetables, fruit, brown bread or porridge. As no other cause was found for the constipation, it seemed probable that it was a result of this diet. In order to test this view, the patient was examined with the X-rays after a bismuth meal, on one series of occasions whilst taking his ordinary diet, and on a second series after five days during which he had taken a diet containing porridge and treacle, brown bread, green vegetables, jam and fruit. In Fig. 12 the results obtained are shown in two parallel columns, the numbers indicating the hours which had elapsed since the bismuth breakfast was eaten. The bowels were opened by an enema the day before the first series of observations were made; they

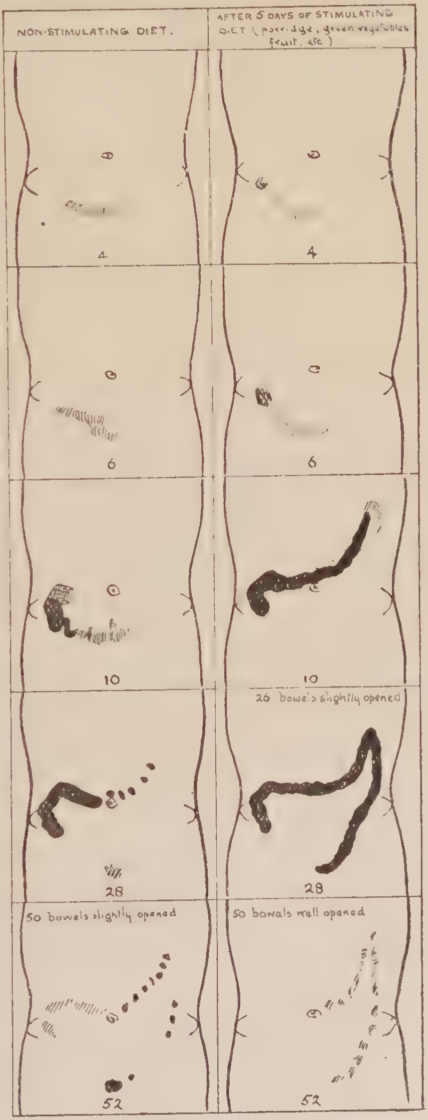
NON-STIMULATING DIET.
AFTER 5 DAYS OF STIMULATING DIET (porridge, green vegetables fruit, etc)
4
4
6
6
10
10
26 bowels slightly opened
28
28
50 bowels slightly opened
50 bowels well opened
52
52

Fig. 12. Constipation due to unsuitable diet.

were also slightly opened on the third morning. On three of the first five days during which the stimulating diet was given the bowels were opened, and they again acted on the second and third of the three days on which the X-ray observations were made. The tracings show that on the first diet more than six hours were required for the food to reach the cæcum ; on the second diet traces had already reached it after the normal interval of four hours. In ten hours the hepatic flexure was reached on the unstimulating diet, but on the stimulating diet only the splenic flexure—a point which is rarely passed in this period in any normal individual. In twenty-eight hours a similar difference was observed, the bismuth having reached with the stimulating diet a normal position in the pelvic colon instead of the distal part of the transverse colon. In fifty-two hours a good deal of the bismuth was still present in the colon with the first diet, but only traces remained with the second diet.

Thus the diet rich in cellulose and sugar had the effect of hastening the passage of the intestinal contents through both the small intestine and the colon. At the same time it probably produced a more abundant intestinal secretion and allowed a larger growth of bacteria in the colon, so that the amount of each of the three chief constituents of fæces—food residue, intestinal secretion and bacteria—was increased. Consequently sufficient fæces were now present in the pelvic colon each morning to provide for a daily evacuation of normal dimensions. It was accordingly found that the patient's bowels became more regular as soon as the change in diet had been made, and at the end of a fortnight, when he was discharged, they acted daily. The patient was seen again eleven months after his discharge, and he stated that his bowels had been well opened every day. Except during two relapses of short duration, no medicine or other treatment was given in addition to the diet, the correction of which was sufficient by itself to cure the constipation.

(3) *Excessive digestion of food : 'greedy colon.'*—The total weight of fæces passed by constipated individuals is of course considerably less than that passed by normal people. This is not due merely to the greater dryness of constipated stools, as numerous observations have shown that the weight of the solid constituents of the fæces is always more or less diminished. Strasburger[3] found that microscopically a remarkably small quantity of food débris,

such as muscle-fibres, starch-cells and vegetable membranes, is found in constipated stools, and Lohrisch's[4] analyses showed that the amount of nitrogen, fat and cellulose in the fæces is considerably less in constipated than in normal individuals. In a diet with an energy value of about 7,000 calories, about 270 calories are normally lost in the fæces, but an average of only 170 were lost in the cases of constipation which he investigated.

The following figures in grammes show the average amount and composition of the fæces of three constipated patients examined by Strasburger and two by Lohrisch, compared with those of three normal individuals examined by Strasburger and three by Adolph Schmidt, all being on the same diet :—

	Weight of fæces per diem.	*Dried fæces.*	*Nitrogen.*	*Fat.*	*Carbohydrate.*	*Cellulose.*	*Dry bacteria.*	*Percentage bacteria to dry substance of fæces.*
Normal	107	23	3·0	13·8	1·8	0·08	8	30
Constipated	60	16	1·5	8·4	1·4	0·02	6	30

Strasburger has shown that in constipation the quantity of bacteria is reduced in proportion to the total weight of dried fæces. Thus each of the three chief constituents of the fæces—food residue, intestinal secretion and bacteria—are diminished in quantity in constipation. The diminution in water is simply due to increased absorption owing to the abnormally long period during which the intestinal contents are retained before excretion. In most cases this is probably also the cause of the diminished quantity of food residue and intestinal secretion, as both of these are likely to be absorbed during their prolonged retention in the colon. Goodhart[5] in 1902 expressed his belief that the absorbing power of the intestines is much greater in some individuals than in others, and that the 'greed of the colon' may be a cause of constipation, especially in those individuals, who take plenty of food and yet in spite of constipation have a retracted and apparently empty abdomen.* In the same year Strasburger, as a result of his investigations on the fæces of constipated patients, expressed a similar opinion. He believed that the constipation was due mainly to a diminution in the quantity of intestinal contents to be excreted, owing to an abnormally active digestion in the intestines, and further that this resulted in a deficiency in the culture media required for the growth of bacteria in the large intestine, as shown by the diminution in the number of bacteria in the stools and the fact that no increase occurs on giving colon bacilli by mouth; for this reason there is less production by putrefaction and fermentation of substances which normally act as stimuli to the intestinal movements.

Perhaps in some cases the small quantity of fæces excreted by constipated individuals is due in part to the secretion of an abnormally small quantity of intestinal juice. There is, however, at present no method known by means of which the relative proportion of food residues and of intestinal secretion in the fæces can be estimated.

Lohrisch made some investigations, at Adolph Schmidt's suggestion, which, he believed, proved that the diminution in the weight of dried fæces in constipation is always due to abnormal activity of digestion. He found that in two individuals, in whom constipation was artificially produced by means of opium, the weight of dried fæces was not diminished, although the fresh fæces were drier than normal. He concluded that simple retention of fæces does not cause increased absorption of solid matter, but that this only occurs as an abnormal condition in certain individuals, in whom it manifests itself as chronic constipation. But Lohrisch's experiments are quite inconclusive, as Magnus[6] has shown that, at any rate in animals, morphia produces no delay in the passage through the intestines, the constipation being solely due to the prolonged retention of food in the stomach, to which it gives rise. It is also probable that morphia disturbs the secretory and absorptive functions of the alimentary canal. Moreover, Glaessner[7] produced severe constipation in two dogs by reversing a short length of their intestines: though they took their food well, both the dry substance and nitrogen of their fæces were diminished.

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* This type of constipation seems to have been recognized by Cullen, who wrote in his *Treatise of the Materia Medica* (ii, 497, Edinburgh, 1789) that constipation might be due to the 'vigour of the alimentary canal', as 'the concoction of the aliments is more completely performed, and probably a smaller proportion of fæces is produced'.

Although Lohrisch's conclusions have thus been shown to be fallacious, and the frequency of a greedy colon has been exaggerated by such writers as Adolph Schmidt, there is no doubt that cases do occur, in which constipation is due to unusually active intestinal absorption. The following case is an extreme example of this condition :—

Case 5. Constipation due to greedy colon.—Margaret W., a governess, 23 years old, was admitted into Guy's Hospital in November, 1908, for severe constipation, which followed an attack of diphtheritic paralysis when she was 18. Up to that time her bowels had been perfectly regular, but for the last five years they have never been opened more than once every five days in spite of the daily use of cascara sagrada, and the infrequent stools obtained were always small and semi-fluid. Moreover, during the whole of this period she has never experienced the sensation, which gives rise to the desire to defæcate.

She was in the hospital two years ago and received temporary benefit. Three weeks before the present admission she had an attack of vomiting and giddiness brought on by straining in an attempt to defæcate. Since then she has been sick every day. She feels tired and has been subject to headaches, but the constipation has not affected her nutrition, as she is well nourished and not anæmic.

On admission the tongue was furred and the breath very offensive. The rectum was found to be completely empty and no accumulation of fæces could be felt in the colon by abdominal palpation, although the bowels had not been well opened for more than three weeks.

Purgatives of various kinds were found to be ineffective and enemata generally failed to act. In spite of this, no accumulation of fæces formed as far as abdominal palpation and rectal examination could show, and large irrigations of the colon only brought away a small quantity of fæcal matter.

A bismuth breakfast was given and it was found with the X-rays that the passage through the intestines was not delayed, the cæcum being reached in four hours and the pelvic colon in twenty-eight hours (Fig. 13). Hence the constipation could not be due to sluggish action of the intestines. The empty condition of the colon and rectum, even after the bowels had remained unopened for four or five days, showed that an abnormally small quantity of fæces must be produced, though what is produced travels through the intestine at the normal speed. This is in accord with the patient's history that her bowels have rarely been opened more than once every five days, in spite of which, when they were opened, only a small motion was passed. If a normal quantity of fæces had been formed, there would therefore now be an enormous accumulation of fæces in the colon, but there is none. The only explanation of the case seems to be that the patient has a 'greedy colon', so much absorption occurring that by the time the pelvic colon is reached there is hardly anything left; perhaps also there is deficient intestinal secretion, but Dr. Eyre found that the proportion of bacteria in the fæces was about normal.

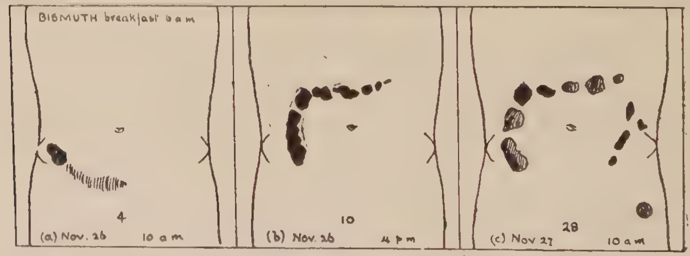


FIG. 13. Constipation due to greedy colon.

This view of the case explains the complete failure of purgatives, as they merely hasten the passage of the small quantity of intestinal contents, which already move sufficiently quickly, and the comparative success of large enemata, which are able to remove most of the very small quantity of fæces collected in the colon.

The patient was given three drachms of regulin (*vide* p. 285) in mashed potatoes at dinner every day with the object of increasing the bulk of her fæces, but after ten days it produced no appreciable increase in the quantity passed. After a week's interval it was tried for another ten days, but with no greater success. Two days after the regulin was discontinued the patient's mouth temperature suddenly rose at 2.30 p.m. to 110° and she felt extremely ill; it fell to 101° when she was sponged, but rose again to 111·4° at 5.30; at 6.15 it had fallen to 97·6°. At 8 p.m. it again rose for a few minutes to 104°. After this it remained normal until 6 a.m. the next morning, when it rose in half an hour to 108°, from which it fell in a few minutes to normal and did not rise again. Dr. Newton Pitt, under whose care the patient was while in the hospital, tells me that all possibility of deception seems to have been excluded. It is very difficult to explain this attack of hyperpyrexia. It does not seem likely that it can be connected with the administration of the regulin, as the drug had not been given during the previous two days. Very little of it, however, had been excreted at the time the temperature rose, so it is just possible that the mixture of its chief ingredient—agar-agar—with intestinal juice formed an unusually good culture medium for the intestinal bacteria, and that the hyperpyrexia was due to a sudden toxæmia of intestinal origin. It is a remarkable fact that the patient began to pass more fæces immediately after the attack of hyperpyrexia, although no more regulin was given. She still required enemata, but whenever these were given she passed a formed stool. This did not, however, continue for long, as after another month had elapsed, only sufficient fæces were formed for one stool to be passed each week. Examination of the results of the enemata showed that during a first period of 12 days she passed 4·3 grms. of dried fæces or 0·36 grms. per diem, and during a second period of 8 days 5·1 grms. or 0·64 grms. per diem. During the next 3 days she took ʒiij of agar-agar (p. 285) a day, but only passed 3·9 grms. or 1·3 grms. a day. On the diet she was taking, a normal individual would pass about 40 grms. of dried fæces a day.

The investigation of this case shows that the constipation of patients with a greedy colon may be simply the result of too little fæces arriving in the rectum to produce the distension, which gives rise to the desire to defæcate and to the reflex act itself. The rate of passage through the intestines was normal, so that Strasburger's theory that the constipation is in part due to deficient production of the chemical stimulants of motor activity from lack of a proper culture medium for the intestinal organisms does not hold good, at any rate in this particular case. Perhaps, therefore, this class of constipation would be more correctly grouped under the head of dyschezia.

(4) *Deficient exercise.*—The importance of exercise for maintaining the regularity of the bowels has been exaggerated. For many individuals who take no exercise at all never suffer from constipation, and Dunin[8] remarks upon the fact that the complete rest, which is one of the chief features of the Weir-Mitchell treatment, often has a remarkably good effect upon the bowels in the constipation of neurasthenia. On the other hand, one of the most obstinate cases of constipation I have ever seen was in the owner of a sheep-farm in Australia, whose life was unusually active, and Ewald[9] states that very severe constipation is not at all rare among officers in the German army.

But there is no doubt that want of exercise tends to produce constipation, and this is particularly the case when there is a sudden change from an active to a sedentary life. This is sometimes noticeable after a very few days of inactivity, as, for example, when an active man is rendered temporarily inactive by an accident or during a long journey, and the constipation thus initiated sometimes lasts for a considerable time after his return to his customary occupations.

The effect of physical activity on the bowels is to a great extent indirect. People of the same class of life, living in the same district, take as a rule about the same quantity of meat, but the amount of vegetable food they eat varies to a great extent according to their occupation. Those who lead an active life require more food than those who lead a sedentary life, and the main addition to their diet is in carbohydrates rather than proteins. Hence active people take a diet which stimulates the intestinal movements much more than that taken by inactive people, who consequently are likely to become constipated.

Want of exercise also tends to weaken the abdominal muscles and diaphragm, so that dyschezia results from the inefficiency of the voluntary part of defæcation. The loss of the mechanical stimulation of the intestines, produced by the rhythmical variations in the intra-abdominal pressure caused by the increased excursions of the diaphragm when exercise is taken, is an additional factor.

Tight-lacing is probably a subsidiary cause of constipation, owing to the impairment in the activity of the diaphragm to which it gives rise.

(*b*) **Interference with the afferent impulses producing reflex intestinal activity.** Abnormal conditions of the mucous membrane of the colon, such as catarrh or the atrophy which may follow a catarrh, probably lead to a diminution in the excitability of the afferent fibres passing from the mucous membrane to the peripheral nerve-centres. By causing a diminution in reflex intestinal activity, this leads to constipation or aggravates it if already present. The constipation, which is often a sequel as well as a symptom of catarrhal colitis, is to some extent also due to the atony of the intestinal musculature which often results from the catarrh. Long-continued irritation by purgatives or by excess of stimulating food also leads to a diminution in the excitability of the intestinal mucous membrane. This accounts for the fact that the over-activity of the bowels, which is the primary result of the constant use of purgatives, may be finally replaced by obstinate constipation.

Astringents, whether given by mouth or by rectum, exert a similar harmful influence on the intestinal mucous membrane. The constipating effect of tannin is particularly frequent among the poor, who, in addition to eating white bread instead of brown, and potatoes and bananas instead of green vegetables and apples or plums, diminish the irritability of their intestinal mucous membrane by drinking excess of tea. Strong tea, which is allowed to stand for long periods in contact with the leaves until it becomes very rich in tannin, is, with the exception of beer and spirits, the most popular as well as the most injurious of the beverages which find favour among the poor. The well-to-do drink as a rule smaller quantities of tea, which is generally less strong. Moreover, they can afford to buy China tea, which has the great advantage over that of India and Ceylon of containing less tannin. A cup of black coffee contains even more tannin than a cup of Ceylon tea, but fortunately coffee is very rarely drunk in excess. Moreover, when a large proportion of milk is added, most of the tannin combines with the caseinogen and lactalbumin, and is thus rendered inert. In some individuals coffee actually seems to exert a laxative action, presumably because of the caffeine it contains. Cocoa also contains almost as much tannin as tea, but this is probably rendered innocuous by combining with the protein which is present.

(*c*) **Depression of the nervous system.**—Atony of the colon, which is frequently associated with a similar condition in the stomach, is one of the commonest results of functional nervous disorders, in which, owing to depression of the nervous system, there is a diminished response to the stimuli which normally excite intestinal activity. Constipation is thus often present in neurasthenic and hypochondriacal individuals, and it is of extreme frequency in the insane, especially in melancholics. In such cases it is generally in part also due to the diet, which is insufficient in quantity and in stimulating ingredients. Sometimes, especially in melancholics, deficient intestinal juice may be an additional factor, as in these patients all the secretions are diminished in quantity, and large doses of pilocarpine often fail to produce any sweating. In the severer forms of insanity the constipation is, doubtless, increased by the mental power being so deficient that the calls of Nature are often neglected.

Case 6. *Constipation of nervous origin.*—Michael W., aged 48, was admitted under my care into Guy's Hospital in August, 1907. Until two years before his bowels had been perfectly regular. For no obvious reason he then gradually became constipated. During the last six months he has been under medical treatment, but even with the aid of purgatives his bowels have been opened only two or three times a week. For a year the hard scybala which constitute his stools have been coated with mucus, but no blood has been passed. He has had some abdominal pain and has been losing weight. He has been much worried about his condition, as he has feared that he must have cancer.

On admission, hard fæces could be felt in the transverse, the descending and the iliac colon. No peristalsis was visible. The lower part of the rectum was found to be empty and rather ballooned, but some hard fæces could be felt high up. Enemata were administered with a good result, no fæces being any longer palpable in the colon. The patient was given a full diet, but no purgatives.

It was found with the X-rays (Fig. 14) after a bismuth breakfast that the cæcum was reached at the normal time and that the passage up the ascending colon was not delayed. But four hours after the hepatic flexure had been reached the shadow was unaltered. The next morning, twenty-four hours after the bismuth had been taken, the cæcal shadow was less obvious, but nearly all the bismuth was still in the ascending colon, only the first two inches of the transverse colon being faintly visible. On the third day the bowels were opened slightly without the aid of medicine, but no X-ray examination was made. On the fourth day, seventy-seven hours after the bismuth breakfast, the shadow of the cæcum and ascending colon was no longer visible, and that of the first half of the transverse colon was faint. The distal half of the transverse colon now contained almost all the bismuth, none having reached beyond the splenic flexure. An aperient was given in the evening and an enema the next morning: the bowels were well opened, and on subsequent examination with the X-rays it was found that all the shadow had disappeared.

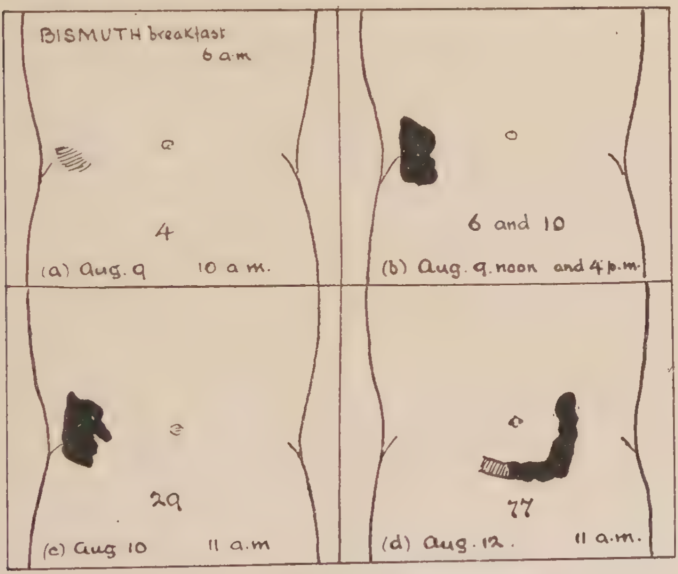


Fig. 14. Constipation of nervous origin.

In this case there was considerable sluggishness of the colon beyond the hepatic flexure. There was nothing in the shape of the shadows pointing to the presence of any organic obstruction, so a diagnosis of chronic constipation due to inactivity of the colon was made. The patient's fæces were also examined for 'occult' blood, whilst he was kept on a meat-free diet for a few days. None was found, thus making the absence of any malignant disease of the intestine still more probable.

The mucus which had been present in the stools was probably due to catarrh, caused by the irritation of the hard fæces retained in the colon. The recent want of success in the use of purgatives was a result of the obstruction offered by the accumulation of hard fæces in the large intestine, which purgatives could not completely overcome, even in doses sufficient to produce painful contractions. As the retained masses had now been removed by enemata, treatment by purgatives seemed likely to be successful, and it was found that moderate doses of magnesium sulphate with cascara sagrada were sufficient to produce a daily evacuation of normal fæces without mucus.

Seven months after the patient's discharge from the hospital I had the opportunity, through the kindness of Dr. A. K. Matthews, of examining him again. He had not put on much weight and was still much worried about himself, although he only complained of vague abdominal discomfort. He was, however, much less constipated, and he had passed no more mucus. He was again examined with the X-rays, and it was found that the whole colon was traversed at the normal rate, the shadow of the large intestine from the cæcum to the end of the iliac colon being visible twenty-eight hours after the bismuth breakfast (Fig. 15). The bowels had been opened two hours before the examination; otherwise the shadow of the pelvic colon would probably have been also visible. The second morning after the bismuth meal only a trace of the descending colon was visible, as the bowels had been well opened and most of the bismuth discharged. Hence the activity of the colon was now normal, although no aperient was being taken. The patient was greatly pleased to hear definitely again that he had no sign of cancer, and it seems probable that with his mind relieved his bowels will continue to act regularly, and he will be less worried with abdominal discomfort. The course of the case and the mental condition of the patient suggest that the constipation was due to deficiency in the reflex activity of the colon, brought about by a depressed condition of the nervous system.

Case 7. *Constipation associated with hypochondriasis.*—A medical man, aged 45, asked Mr. Lane to remove his colon on account of constipation of several years' duration, his bowels being open only two or three times a week. Mr. Lane asked me to examine him, as he considered that he would probably turn out to be an unsuitable case for operation. The patient looked healthy and had no abdominal pain or tenderness. He was extremely hypochondriacal. He said that he had suffered ever since his student days from one abnormal condition after another, and he had spent his life in undergoing cures for migraine, gastritis and gastric ulcer, dysentery and mucous colitis, excess of uric acid and renal colic, difficulty in micturition and irregularity and palpitation of the heart. He was in the habit of palpating his abdomen, so that, although his abdominal muscles were quite strong, he could relax them with remarkable completeness, making the examination of his abdomen unusually easy. He gave a very detailed description of the condition of his alimentary canal. His stomach, he said, was dilated and extended well below the umbilicus; his transverse colon dipped into the

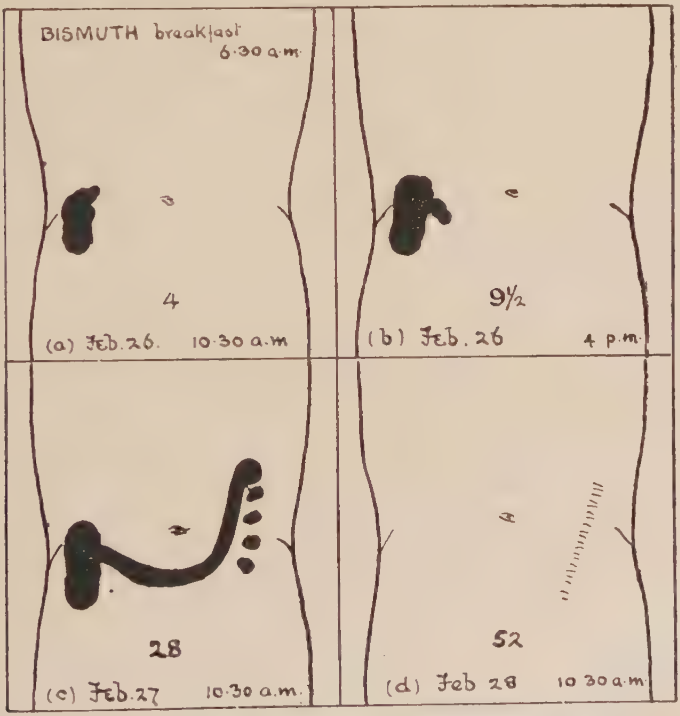
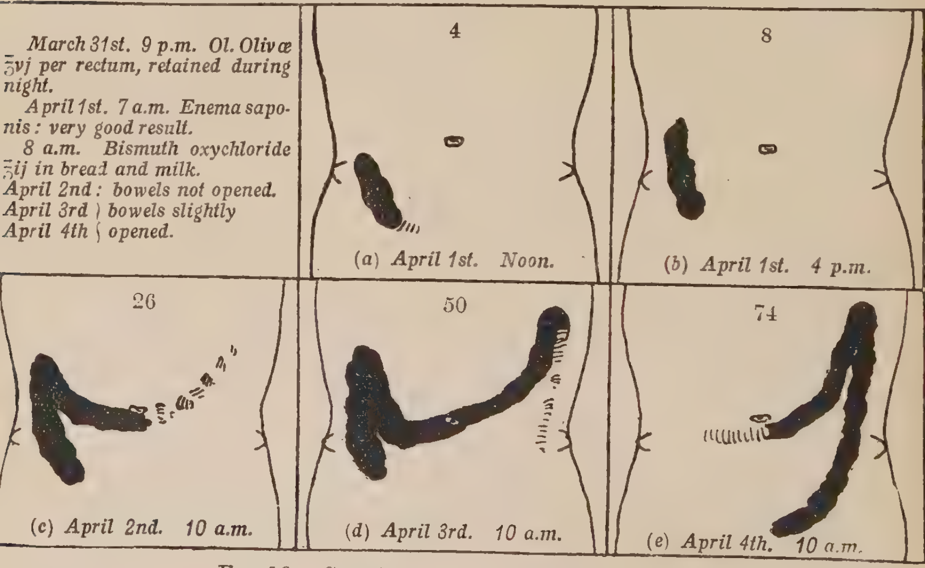


FIG. 15. Same case as Fig. 14, seven months later.

pelvis ; the lumen of the colon was normal up to a point two inches below the splenic flexure, where there was a funnel-like narrowing leading to the descending colon, which could barely admit the little finger ; the pelvic colon had disappeared and the narrow descending colon ended in a dilated rectum, in which the fæces, which were squeezed through the descending colon, coiled round and formed an accumulation similar in structure to the casting thrown up by earthworms.


March 31st. 9 p.m. Ol. Olivæ ℥vj per rectum, retained during night.
April 1st. 7 a.m. Enema saponis : very good result.
8 a.m. Bismuth oxychloride ℥ij in bread and milk.
April 2nd : bowels not opened.
April 3rd) bowels slightly
April 4th (opened.

(a) *April 1st. Noon.* (b) *April 1st. 4 p.m.* (c) *April 2nd. 10 a.m.* (d) *April 3rd. 10 a.m.* (e) *April 4th. 10 a.m.*

FIG. 16. Constipation with hypochondriasis.

On palpation the cæcum and ascending colon were readily felt and appeared to be normal ; the transverse colon was not palpable, the descending colon was felt to be contracted, but not more than is often the case when it is empty, and the rectum was normal.

The patient had been strictly dieting himself for many months, but was now put on an ordinary mixed diet. His bowels had not been open for three days before admission, so six ounces of olive oil were injected *per rectum* in the evening and retained during the night, and the next morning a soap enema was given with a good result. Two ounces of bismuth oxychloride were then taken in bread and milk. In four hours the cæcum and part of the ascending colon were visible, and in eight hours the whole of the ascending colon could be seen (Fig. 16). The next morning the proximal half of the transverse colon, normal in position, was clearly defined, and the distal half only contained a little bismuth. On the third morning, fifty hours after the bismuth meal, the splenic flexure was reached and a little bismuth was found in the descending colon, and on the fourth morning, seventy-four hours after the breakfast, the cæcum, ascending colon and commencement of the transverse colon were empty, whilst the distal half of the latter and the whole descending colon were seen. Thus the ascending colon was traversed at the normal rate, but there was considerable delay in the passage through the transverse and the descending colon. The lumen of the descending colon was no smaller than that of the transverse colon, so that nothing like the stricture described by the patient was really present. The series of tracings could in fact quite well represent the passage of a bismuth meal through a normal colon, if it were condensed into two instead of four days.

The constipation in this case was largely due to the insufficient residue left by the diet, which had been carefully chosen by the patient for its non-irritating character. The natural chemical and mechanical stimuli to the colon were consequently to a great extent absent. But the colon reacted to such stimuli as it received less readily than normally, as during the X-ray examination the patient was on an ordinary mixed diet: this must have been due to the depressed condition of the patient's nervous system.

The patient was given a full diet with plenty of green vegetables and fruit. For a time stimulating aperient pills containing aloes and nux vomica will be required, but it may be confidently expected that, if the patient obeys his new rules with regard to diet and becomes less hypochondriacal, they may finally be given up. The skiagraphic examinations had an excellent mental effect on the patient, as they served to prove to him that his ideas of an abnormal anatomical condition of his colon, which had worried him for many years, were quite erroneous.

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[1] J. B. Morgagni: *The Seats and Causes of Diseases.* Letter xxxii, 1761. Eng. Trans., ii, 107, 1799.

[2] Richard Powell: *Observations on the Bile and its Diseases*, p. 85. London, 1800.

[3] J. Strasburger: *Zeitsch. f. klin. Med.*, xlvi, 413, 1902.

[4] H. Lohrisch: *Deutsch. Arch. f. klin. Med.*, lxxix, 383, 1904.

[5] J. F. Goodhart: *Lancet*, 1902, ii, 1241.

[6] R. Magnus: *Pflügers Archiv*, cxv, 316, 1906, and cxxii, 21, 1907.

[7] K. Glaessner: *Wien. klin. Woch.*, xvii, 1205, 1904.

[8] T. Dunin: *Berl. Klinik*, Heft 34, 35, 1891.

[9] C. A. Ewald: *Klinik der Verdauungskrankheiten*, iii, 113. Berlin, 1902.

CHAPTER III

INHIBITION OF THE MOTOR ACTIVITY OF THE INTESTINES

THE inhibitory fibres of the sympathetic nerves may be stimulated (*a*) directly, as in lead poisoning, (*b*) centrally by depressing emotions, and (*c*) reflexly from painful abdominal viscera. (*d*) Nicotine paralyses the peripheral sympathetic ganglia; habitual smoking therefore diminishes their normal inhibitory influence on the intestines, so that the sudden discontinuation of smoking may give rise to constipation by increasing inhibition.

The inhibitory nerves of the small intestine and colon come from adjacent parts of the spinal cord, and have their cell-stations in closely related sympathetic ganglia. This is in contrast to the widely separated origin of the motor nerves, those for the small intestine being supplied by the vagi, and those for the colon by the sacral nerves. Hence inhibition frequently affects the movements of all parts of the intestine simultaneously, whereas the motor nerve-supply to the small intestine is likely to be affected independently of that to the colon. It might therefore be expected that, in cases of constipation which result from inhibitory impulses, delay would occur in the small intestine as well as the colon. In agreement with this, among the few cases of constipation, in which I have observed delay in the small intestine, whilst a full diet was being taken, were two patients with lead poisoning (*vide* Case 8), this being a condition in which the constipation is probably due to irritation of the inhibitory fibres in the sympathetic nerves.

All such cases of constipation can be more or less relieved by sedatives, such as opium, which diminish the inhibition of the intestinal activity. On the other hand, purgatives are required in unusually large doses in order to produce any action, although small doses are often very efficacious if combined with opium, the stimulation of peristalsis being then increased at the same time as its inhibition is diminished.

(*a*) **Direct stimulation of the inhibitory fibres to the**

intestines.—The following case, reported by MacCallum,[1] shows that direct irritation of the abdominal sympathetic in man as well as in animals inhibits intestinal movements :—

> A patient suffering from all the symptoms of intestinal obstruction, with great distension of the intestines and vomiting, was operated on by Halsted, but no obstruction was found. Later, at the autopsy, the aorta was found to have ruptured, with the production of a dissecting aneurysm. The walls of the aorta and the retroperitoneal tissue were infiltrated with blood as far down as the lower lumbar region. In this case the symptoms must have been due to complete inhibition of peristalsis resulting from irritation of the sympathetic nerves by the effusion of blood.

Constipation in lead poisoning, when unaccompanied by colic, is probably due to the action of the metal on the sympathetic nerves, the irritation of which produces inhibition of the movements of both the small and the large intestine. The rise in blood-pressure, which is almost constantly observed in these cases, is additional evidence that the sympathetic nerves are irritated. Mosse[2] found that the subcutaneous injection of lead acetate produces degenerative changes in the abdominal sympathetic ganglia of animals.

When the constipation is associated with colic, the vagus is probably irritated, and irregular intestinal contractions are produced. Orderly peristaltic waves are thus replaced by useless and painful spasm of the small intestine. This is confirmed by the observations of Oliver[3] on animals, which had died from lead poisoning : the small intestine was irregularly contracted—in some places so tightly that it felt like a piece of cord, its lumen being completely obliterated. Singer[4] has also observed spasmodic contractions of the pelvic colon in cases of lead colic during a sigmoidoscopic examination.

> *Case* 8. *Lead poisoning.*—Edwin H., aged 53, was admitted into Guy's Hospital for the fourth attack of severe constipation which he had had during the last two years. The present attack began in April, 1907, and, when admitted on June 1, his bowels had not been opened and he had had severe vomiting for nine days. He had no colic, but he was very anæmic and had a well-marked blue line on his gums.

The source of the lead poisoning appears to have been contaminated cider. He was given castor oil on admission and again on June 2, but his bowels were not opened until he was given an enema on June 3. The next day another enema was given with an equally satisfactory result. After this, as the sickness had ceased and there was no abdominal pain, medicine and enemata were omitted for a few days, so that the nature of his constipation could be investigated with the X-rays. It was found that the small intestine was involved in the constipation as well as the colon, as after six hours the cæcum was still invisible, and after eight hours it was only faintly seen (Fig. 17). The next morning, although the bowels were still unopened, the shadow had not reached beyond the proximal limit of the splenic flexure, and six hours later very little further progress had been made.

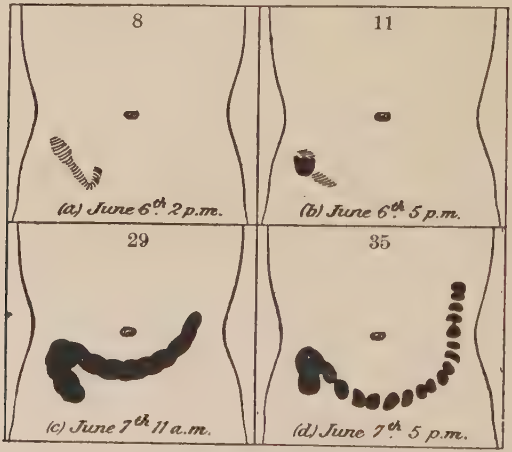

FIG. 17. Constipation due to lead poisoning. Bismuth breakfast at 6 a.m. on June 6.

As no narrowing of the colon was noticed with the X-rays and colic was absent, the constipation in this case was probably due to irritation of the sympathetic and not of the vagal nerve-supply of the intestines.

The patient was given small doses of cascara sagrada three times daily, with the result that his bowels were well opened every morning. A few days later he was again given a bismuth breakfast and examined with the X-rays. It was found (Fig. 18) that there was now no delay in the passage of fæces through the alimentary canal, the extra stimulus produced by the cascara in both the small and large intestines having been sufficient to restore their activity to normal, in spite of the inhibitory impulses still reaching the peripheral nerve-centres. The latter, however, were probably already much diminished owing to the excretion of the lead in the fæces.

(*b*) **Depressing emotions.**—Temporary constipation often follows depressing emotions, and many constipated people find that the difficulty they experience in getting their bowels to act increases whenever they are worried or annoyed.

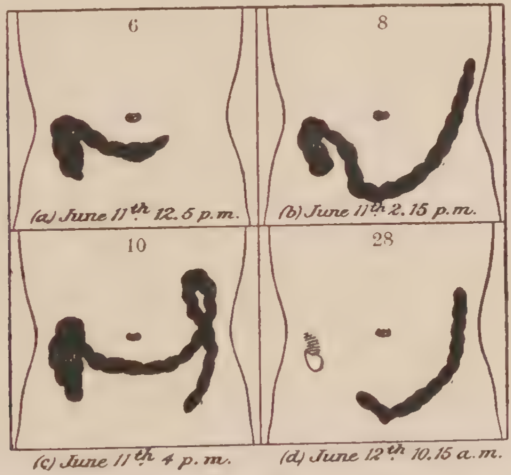

FIG. 18. Constipation, due to lead poisoning, under treatment. Bismuth breakfast at 6 a.m. on June 11.

The following case, described by Goodhart, is a good example of this kind of constipation :—

> 'A man of the most regular habits was in a bad railway accident, and he was buried in a complete wreck of carriages for thirty-five minutes. He was not broken, but his nervous system was so shattered that for days his bowels refused to act, although he took all sorts of things to make them do so.'

Cannon proved by X-ray observations on cats that anger produces intestinal stasis by causing inhibitory impulses to pass down the sympathetic nerves. The constipation, which results from depressing emotions, is probably brought about in the same way. This would explain the fact that bromides have often a better effect on the bowels in such cases than purgatives.

It might be expected that the constipation of neurasthenia and hypochondriasis is also of this nature. Though direct inhibition may increase the intestinal torpor in such cases, it is probable that depression of reflex excitability is, as already described, the chief factor. Thus in none of the cases of neurasthenic constipation, which I have examined with the X-rays, was there any of the delay in the small intestine, which is characteristic of constipation due to inhibitory influences. Moreover, neurasthenic constipation is readily—though only temporarily—relieved by aperients, which are generally of little value, unless given with opium, when constipation is due to inhibition.

(*c*) **Reflex inhibition of intestinal activity.**—Pawlow discovered that reflex inhibition of the gastro-intestinal movements was produced by stimulation of sensory nerves in animals, the efferent impulse being carried by the sympathetic nerves. A similar inhibition is the cause of the constipation which is frequently produced in man by the painful stimulation of sensory nerves in diseases and injuries of any part of the body, but particularly of the abdominal and pelvic viscera. Lauder Brunton[5] mentions a case of Littlejohn's, in which half a grain of opium, given for the pain caused by an inflamed ovary, produced the first natural stool which had occurred for a long time. Similarly the pain produced by diseases of the stomach, uterus, bladder and prostate, and the colic produced by the passage of a biliary or renal calculus give rise to reflex constipation. Throughout an attack of biliary or renal colic there is generally complete intestinal stasis, with retention of gas as well as fæces, so that the abdomen becomes distended. Sternberg[6] has shown that this is always associated with a rise of blood-pressure, which is additional evidence of the reflex activity of the sympathetic nerves. Purgatives have no effect on this reflex constipation, but opium causes the bowels to open at the same time as it relieves the colic.

Chronic appendicitis is often associated with constipation, which disappears on removal of the appendix. Contusion, inflammation and torsion of the testicles give rise to reflex inhibition of peristalsis. Treves[7] was twice asked to operate for strangulated inguinal hernia on boys, who had been seized with violent abdominal pain, collapse, vomiting and absolute constipation; but the painful irreducible swelling in the inguinal canal proved to be a twisted undescended testicle. Such cases are explained by the observations of Cannon and Murphy[8] with the X-rays, which showed that crushing the testicles in animals causes the intestinal movements to cease, but that this effect is abolished by cutting the splanchnic nerves.

A blow in the abdomen may produce such profound inhibition of the intestinal movements that death occurs from ileus, although nothing abnormal is found at the autopsy. Post-operative ileus, apart from peritonitis, is due to the reflex inhibition, which Cannon and Murphy[9] have shown results from handling the stomach and intestines, especially if the mesentery be much stretched; the anæsthetic and the mere exposure of the viscera to the air do not contribute to the result. It is accordingly found that when very large doses of purgatives and strychnine have proved completely useless in such cases, relief occasionally follows the administration of twenty-five grains of veronal, which must act by diminishing the inhibition.

The intestinal stasis, which occurs on perforation of any abdominal viscus, is due primarily to the irritation of the peritoneum producing reflex inhibition of the intestinal movements and contraction of the ileo-cæcal sphincter; the peritonitis, which develops later, increases the constipation by the directly injurious effect of the inflammation, which spreads to the muscular layer of the intestines. Reflex inhibition may be a factor in the aggravation of constipation, when it is complicated by inflamed hæmorrhoids or anal ulcers, although the dyschezia, which is produced by the attempt to prevent pain by voluntarily restraining the desire to defæcate, is of more importance.

(*d*) **Effect of tobacco.**—Many men find that a cigar or pipe smoked immediately after breakfast helps them to obtain a proper evacuation. When for any reason an individual, who has been in the habit of smoking a good deal, suddenly gives up tobacco, constipation is sometimes prominent among the discomforts from which he may at first suffer. In such cases the return to a morning cigar or pipe may at once result in the disappearance of the constipation. The effect is probably due to the sudden increase in the inhibitory impulses reaching the intestines, which had previously been partially paralysed by the action of nicotine on the sympathetic ganglia.

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[1] W. G. MacCallum: *Journ. of Amer. Med. Assoc.*, xlix, 1014, 1907.

[2] Mosse: *Centralbl. f. inn. Med.*, xxiii, 281, 1902.

[3] T. Oliver: *Lead Poisoning*, in Allbutt and Rolleston's *System of Medicine*, ii, 1046, second edition, 1906.

[4] G. Singer: *Wien. klin. Woch.*, xxi, 1773, 1908.

[5] Sir Lauder Brunton: *Constipation*, in Allbutt and Rolleston's *System of Medicine*, iii, 643, second edition, 1907.

[6] M. Sternberg: *Wien. klin. Woch.*, xiv, 381, 1901.

[7] Sir F. Treves: *Intestinal Obstruction*, p. 440. London, 1899.

[8] W. B. Cannon and T. F. Murphy: *Journ. Amer. Med. Assoc.*, xlix, 840, 1907.

[9] W. B. Cannon and T. F. Murphy: *Annals of Surgery*, lxiii, 512, 1906.

CHAPTER IV

SPASTIC CONSTIPATION. ENTEROSPASM

THIS condition was first described by John Howship, Surgeon to St. George's Infirmary, London, in 1830, in a small book of *Practical Remarks on the Discrimination and Successful Treatment of Spasmodic Stricture in the Colon, considered as an occasional cause of habitual confinement of the bowels.* He describes how in some cases of constipation 'the complaint does not so much consist in a defective power of contraction in the whole extent, as in a deficient freedom of relaxation in some one part of the intestinal canal'.

This important observation appears to have been completely forgotten, so that in 1883, when Cherchewsky[1] of St. Petersburg published an excellent account of the condition, illustrated by a full description of six cases,* it was believed that the disease had never before been described. But it was not until ten years later, when Fleiner[2] wrote his first article on spastic constipation, that its comparative frequency was recognized in Germany and in France, where Mathieu and Roux[3] actually believe that two-thirds of the cases of chronic constipation are spastic in nature. Another thirteen years elapsed before attention was drawn to the subject in England by Hawkins[4] in a paper on thirty-five cases of enterospasm. Uncomplicated spastic constipation is certainly uncommon in England; it is more often met with associated with the passage of mucus, in the condition known as muco-membranous colitis.

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* Cherchewsky's last case and possibly also his first seem, however, to

Spastic constipation is about equally common in men and women; the age of the cases seen by Hawkins varied between twenty and fifty-four, but most of the older patients had already been ill for a number of years. I have seen a boy of four with typical enterospasm. Patients suffering from spastic constipation are almost always more or less neurotic, many being definitely neurasthenic and a few hypochondriacal. Most neurasthenic and hypochondriacal people are constipated, but only a small proportion of them suffer from this variety of constipation. Many of the men are brain-workers, but the women have generally no occupation. According to Fleiner, a number of the women suffer from uterine disease. The patients frequently lose weight, and twenty-eight of Hawkins's series were thin, only two being stout.

In every case there is a long history of constipation. This is very obstinate during the attacks, which may recur for many years and last with short intermissions for periods varying between a few days and a few months.

Tenesmus is frequently present and the effort to defæcate, although it involves much straining, is often unsuccessful. Even when a stool is passed, there may still be a sensation as if something were left behind, although the rectum is always nearly empty. Successful defæcation is more or less painful, as the spasm of the colon is often accompanied by spasm of the anal sphincters.

have been really examples of intestinal crises in tabes, and not spastic constipation.

The fæces, which are hard and dry and often coated with mucus, may be quite flat or narrowed to the diameter of a finger or a pencil, but just as often small round scybala are passed. The former more characteristic type of stool is probably produced by spasm of the anal sphincter and not by spasm of the colon, as the fæces moulded into thin pieces higher in the intestines tend to become agglomerated into larger masses in the rectal ampulla ; if sufficiently soft, they may again be moulded into thin pieces on their passage through the contracted anal canal. Thus in one patient, whose stools were invariably formed of thin tape-like masses, I found the rectum filled with moderately soft and quite unformed fæces, which must therefore have been moulded on passing through the anal canal. Fæces similar in form may be passed in organic stricture of the pelvic colon, rectum or anus, and also, according to Nothnagel, in the inanition arising from starvation or cancerous cachexia. The total volume of fæces is abnormally small, owing partly to the diminished amount of water they contain, and partly to a diminution in the amount of food residue, intestinal juices and bacteria, which results from the bland nature and small quantity of food usually taken by such patients.

In the intervals between the attacks slight constipation of the ordinary non-spasmodic sort is generally present. In some cases the attacks are very slight, so that it becomes impossible to draw a definite line between the so-called atonic and spastic varieties of constipation.

Attacks are frequently brought on by overwork or worry and sometimes by a definite shock. On the other hand, they are often relieved by occupying the mind, so that mild exercise, if of a congenial nature, generally produces relief. During an attack there is a dull ache in the abdomen, which often does not amount to actual pain, but it is very wearing on account of its long duration. In some cases there may be nausea, but vomiting is rare.

Thirteen of Hawkins's cases had pain in the right flank or iliac fossa only, twelve in the left flank and iliac fossa only, and four sometimes in one and sometimes in the other. In four the pain was central, and in two it travelled from the umbilicus to the left flank. According to most observers, however, the left side is more frequently affected than the right. The abdomen is generally retracted, and there is often tenderness and rigidity, but it is generally possible to feel part of the contracted colon. When the pain is situated on the left side, the whole of the descending and the iliac colon, or the latter alone, can be felt as a thin, hard and tender cord ; in some cases I have felt the contracted pelvic colon on pressing deeply above the pubes. When the pain is in the right side the colon is not so constantly palpable, but it is sometimes felt as a similar but rather thicker cord in the right flank, the cæcum being at the same time found to be distended and tympanitic and to produce a sensation of splashing owing to the mixture of gas and liquid fæces it contains. According to Mathieu and Roux, the cæcum may sometimes be observed to contract into a cylindrical tumour as thick as the thumb, which relaxes and contracts again during the examination : as the spasmodic contraction occurs at intervals of several minutes, it is necessary to keep the hand on the abdomen for some time in order to recognize the changes, which are said to afford a most valuable sign of spastic constipation. The transverse colon can rarely be felt, but occasionally, especially if the enterospasm is associated with muco-membranous colitis, the whole colon is palpable. In normal individuals the colon, especially the iliac portion, when it is empty, can sometimes be felt as a contracted cord, even if there is no tendency to constipation, and it is not infrequently in a similar condition in cases of dysentery. In the former case there is no tenderness or pain, and in the latter the character of the stools makes a mistake in diagnosis impossible.

The spasm of the colon can be observed to vary in degree from day to day. Succeeding contractions and relaxations cannot often be felt, but rough palpation sometimes produces a violent and painful contraction, while gentle friction may cause relaxation. With the aid of the sigmoidoscope I have watched the occurrence of contractions and relaxations at the pelvi-rectal flexure and in the upper part of the rectum.

With the exception of the cæcum, which is often much distended with gas, the colon immediately above the contracted part is not often dilated, and scybala can only rarely be definitely felt either in the contracted or in other parts of the intestine. Peristalsis is never either visible or palpable.

The following typical case of enterospasm is of particular interest, for it is one of the few in which the condition has been verified by abdominal exploration.* I am indebted to Dr. W. H. Trethowan, who had the patient under observation for two months, for revising my notes of the case.

Case 9. *Enterospasm : laparotomy.*—William K., a highly neurotic man of 48, was seen by me for the first time at the beginning of October, 1908. His family history was excellent, but he had done much hard work as a farmer in Australia, with poor living and financial anxiety. He complained of abdominal pain, which came on in paroxysms lasting for half an hour or more. He had been troubled in this way for five and a half years, but the attacks had become steadily more frequent, and as they were always aggravated by exercise he had been able to do very little work since early in 1905. The pain occurred at different times in all parts of the abdomen, but at first it was confined to the epigastrium, and throughout it was most marked above the umbilicus. It was occasionally brought on by meals, but the chief variations corresponded with the severity of the constipation, from which the patient habitually suffered, and from which relief was never obtained by purgatives. Defæcation was generally followed by considerable pain. The patient vomited occasionally, and had lost two stone in weight since the illness began. Immediately after eating he sometimes experienced ‘ suffocation attacks ’, which caused him to retch, and he complained of neuralgic pains in the head and irritability of the scalp and feet.

On examination he was found to be thin, but fairly muscular. His abdomen was somewhat retracted ; there was considerable rigidity, but very little tenderness. Nothing abnormal could be felt. Digital examination showed that the rectum was empty and normal in every way. The patient was very pessimistic and much worried about himself,

* *Vide* also H. P. Hawkins: *Brit. Med. Journ.*, 1906, i, 65; P. Lockhart Mummery: *Med. Chir. Trans.*, xc, 594, 1907; E. O. Ashe: *Brit. Med. Journ.*, 1907, i, 482; C. W. Dean: *Brit. Med. Journ.*, 1909, i, 647. In the cases described by Hawkins, Ashe and Dean, the small intestine was the seat of the spasm, in that by Mummery the sigmoid flexure.

and had visited about a dozen doctors since his return to England. There were no signs of organic nervous disease.

The long history, the mental condition of the patient, the paroxysmal nature of the attacks and their association with constipation led me to diagnose enterospasm. The patient was given belladonna and codeine, and his bowels were kept open by olive-oil injections, as purgatives had no effect beyond causing great pain. Though the constipation was relieved by means of the oil enemata, the pain could only be controlled by keeping the patient in bed on a milk diet. An increase in the diet or a short time spent out of bed was always followed by a severe attack, which often began very suddenly. The attacks occurred even when the patient was interested in a book or engaged in an exciting game of chess, so that I began to doubt whether the trouble could really be nervous in origin. This doubt became stronger when, a month after he was first seen, a small horizontal tumour became palpable just above and to the right of the umbilicus, in the situation where most pain was now experienced. The tumour was tender and moved slightly on respiration. Under an anæsthetic no further information was obtained, as it was found impossible to produce complete relaxation of the rectus muscle. It was therefore decided to perform an exploratory operation. Two days later, whilst the anæsthetic was being given, the tumour became at first much more easily palpable than it had ever been before, and then it suddenly disappeared. Mr. E. C. Hughes, who operated, found no evidence whatever of organic disease, and no adhesions were present in the neighbourhood of the pylorus or gall-bladder. The first part of the transverse colon, which was situated exactly where the tumour had been felt, was much more contracted than the part to the left of the middle line ; although it did not form a hard tumour, it was seen to vary in calibre during the exploration, and, when most contracted, it was much firmer to the touch than the rest of the colon.

It seemed clear, therefore, that the original diagnosis of enterospasm was correct, and that the tender tumour was the tightly contracted transverse colon.

When the pain is in the right iliac fossa, appendicitis may be simulated. Thus, of the thirteen patients with enterospasm seen by Hawkins with pain on this side, eleven had had their appendix removed, in every case without benefit. The long duration of the attacks without any pyrexia, the occasional history of similar pain on the opposite side, and the knowledge gained by palpation of the abdomen, should prevent a mistake in diagnosis.

When the pain is in the left side, a tumour of the descending or iliac colon may be suspected ; thus an exploratory operation had been performed on two of Hawkins's twelve patients with spasm of the iliac colon. The long history, absence of visible or palpable peristalsis and of marked distension above the contracted part, and the absence of obvious or occult blood from the stools, are points which distinguish enterospasm from cancer of the colon.

The difficulty in diagnosis is greatest in the rare cases of acute attacks of enterospasm, in which pain may be as severe as that of biliary or renal colic, and may be accompanied by sweating and collapse. Such cases sometimes simulate at first the onset of peritonitis or of acute intestinal obstruction, but there is no pyrexia, vomiting is absent or slight, the abdomen is generally retracted and there is no visible or palpable peristalsis. When the hard contracted gut is felt, confusion with an intussusception may occur.

Case 10. *Enterospasm simulating intussusception.*—A boy of four was taken into the hospital under my care on account of severe abdominal pain, which had begun suddenly a few hours before his admission. The transverse and the descending colon were palpable as a hard tumour, so the possible presence of an intussusception was discussed. But the tumour had a considerably smaller diameter than that of an intussusception, and blood and mucus were absent from the stools. The hardness of the tumour was felt to vary from time to time ; under the influence of belladonna and after an enema had been given with a good result, it gradually disappeared and the pain was relieved. A diagnosis of acute enterospasm was therefore made.

Spastic constipation is probably the result of spasm, induced reflexly by the presence of an irritant in the colon of a patient with an abnormally excitable nervous system. The nervous factor is shown by the neurotic temperament of all patients affected with the condition and the frequent history of worry or overwork immediately preceding an attack, as well as by the good effect of belladonna, which diminishes the activity of the motor nerves to the intestines.

The irritant, which gives rise to the exaggerated reflex, is probably in most cases hard fæces, the retention of which is due to the ordinary neurasthenic constipation, which is generally present in the intervals between the attacks. In some cases irritating constituents of the diet, such as pepper, mustard and spices, may perhaps be the exciting cause of the spasm.

It is improbable that spastic constipation is due alone to the mechanical obstruction offered by the contracted intestine, as visible and palpable peristalsis and other signs of intestinal obstruction are never present. A more important constipation appears to be the absence of the normal orderly propulsive activity of the intestine, which is replaced by irregular spasmodic contractions of some parts, whilst others remain almost completely inactive.

Similar spasmodic contractions of the intestines occur in cases of lead poisoning, in which constipation is associated with colic: it has already been explained how in such cases the spasm is the result of direct irritation of the vagus. According to Crämer,[5] excessive smoking may give rise to spasmodic constipation. If this be true, it is probably the result of the paralysing action of nicotine on the sympathetic ganglia: this results in abolition of the tonic inhibition exerted by the splanchnic nerves on the intestines, by means of which their motor activity is regulated, so that the normal intestinal stimulants give rise to enterospasm.

It is possible that in some cases of constipation, secondary to painful diseases of the pelvic and abdominal viscera, the vagi are involved in the reflex instead of the sympathetic nerves, so that intestinal spasm and not inhibition occurs. This view is held by Singer,[6] but there does not appear to be much evidence in its favour.

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[1] Cherchewsky: *Rev. de Méd.*, iii, 876 and 1033, 1883.

[2] W. Fleiner: *Berl. klin. Woch.*, xxx, 60 and 93, 1893.

[3] A. Mathieu et J. Ch. Roux: *Gaz. des Hôp.*, lxxviii, 1095, 1905; and A. Mathieu: *Arch. des Mal. de l'Appar. Dig.*, ii, 667, 1908.

[4] H. P. Hawkins: *Brit. Med. Journ.*, 1906, i, 65.

[5] F. Crämer: *Darmatonie*, p. 60. München, 1906.

[6] G. Singer: *Die atonische u. spastische Obstipation*, p. 34. Halle a. S., 1909.

SECTION B

CONSTIPATION DUE TO EXCESSIVE FORCE REQUIRED TO CARRY THE FÆCES TO THE PELVIC COLON

THE work to be done by the intestinal musculature is excessive, (1) whenever the bulk or consistency of the fæces offers more than the normal degree of resistance, or a foreign body in the intestine gives rise to obstruction, and (2) whenever there is any narrowing of the intestinal lumen. In these cases aperients are generally much less effective than in those in which the muscular activity is insufficient, and sometimes they entirely fail to act. On the other hand, relief is frequently obtained by enemata, although in cases of organic obstruction such treatment is often of no avail. Abdominal examination may reveal the presence of a fæcal accumulation in the intestine, whereas the rectum is generally empty, though a full pelvic colon may be felt through its anterior wall. The increased activity of the intestines in their attempt to overcome an obstruction, whether fæcal or organic in origin, often manifests itself in the production of colic, and the X-rays have shown that this is generally associated with an abnormally rapid passage of the intestinal contents as far as the obstruction.

CHAPTER I

OBSTRUCTION BY FÆCES AND FOREIGN BODIES

(*a*) **Obstruction by fæces.**—When the fæces are excessive in quantity or are abnormally hard and dry, they may give rise to constipation.

(1) *Excess of fæces.*—Big eaters have almost always loose bowels, as the excessive stimulus to intestinal activity, produced by the large residue left by the food, more than compensates for the increased work, which has to be done to propel the bulky fæces along the intestines. When,

however, the residue is increased by lumps of unchewed food, such as are present in the intestines of people who habitually bolt their meals, the increased mechanical stimulation may be insufficient to enable the intestines to carry on the large mass of fæces with sufficient rapidity.

A diet of undiluted cow's milk often leads to constipation in infants by causing the bulk of the fæces to be excessive. In times of famine in Scotland, when nothing was eaten except oats, the large dry residue they left was a frequent cause of constipation, and obstruction was sometimes caused by the production of ' oat-stones '.

(2) *Dry, hard fæces.*—Abnormal dryness and hardness of the fæces is a frequent cause of constipation. This may be due to (α) an insufficient supply of water, (β) excessive loss of water by other channels, (γ) excessive absorption of water from the intestines, and (δ) deficient fat in the diet.

(α) *Insufficient supply of water.*—Many women drink much too little water. This is primarily due to a variety of causes, but the voluntary restriction of the amount of fluid taken results in a diminution in the desire for it, just as a gradual diminution in the amount of food eaten leads to a progressive loss of appetite. As the proportion of fluid in the tissues is hardly altered by variations in the quantity of water drunk, a diminution in the latter leads to a diminution in the water excreted in the urine, sweat and fæces. The consequence is that the fæces become abnormally dry and hard, and the excessive force required to carry them to the rectum results in constipation.

(β) *Excessive loss of water by other channels.*—In diabetes mellitus and diabetes insipidus such large quantities of water are excreted by the kidneys that the fæces become abnormally dry, unless a very excessive amount is drunk. This is one of the chief causes of the constipation, which is almost constantly present in these conditions. The drain on the fluids of the body produced by prolonged lactation is sometimes a factor in the constipation of women.

In hot weather and during prolonged muscular exertion so much water is lost from the skin and lungs that the fæces become dry and constipation may result; the same effect is produced by too frequent indulgence in Turkish baths. In order to compensate for the drain on the fluid of the tissues, caused by acute diarrhœa or the purging produced by an overdose of an aperient, an abnormal amount of water is subsequently absorbed, and temporary constipation frequently follows.

(γ) *Excessive absorption of water from the intestines.*—When retention of fæces occurs as a result of constipation, water continues to be absorbed, so that the fæces become very hard and dry. The accumulation produces an obstruction, which must be completely removed by enemata or other means before any other treatment is likely to be effectual. In rare cases symptoms of complete obstruction are produced, as will be described in a later chapter. The following case is an example of the incomplete obstruction, which is often produced by retained fæces:—

Case 11. *Fæcal obstruction in Landry's paralysis.*—Edward H., a bank clerk, aged 22, became paraplegic in September, 1907. The paralysis rapidly spread up his trunk to his arms and neck; it reached its greatest development about fourteen days after the onset, after which the arms and, to a less extent, the trunk gradually regained their power, but the legs remained completely paralysed. There were no sensory symptoms. The patient had retention of urine during the first week only. A diagnosis of Landry's paralysis was made.

The patient's bowels had previously been quite regular, but from the onset of his illness until his admission into the hospital in February, 1908, they had never acted without an enema, aperients being quite useless. Latterly the enemata only brought away a few small hard scybala. On admission it was found that the descending, iliac and pelvic colon were filled with small scybala. Palpation was very easy, as the abdominal muscles were still feeble, though no longer completely paralysed. Rectal examination showed that the tone of the anal sphincters was normal and that the rectum was full of firm fæces, but it was not distended. The patient had thus well-marked cumulative constipation; the enemata, which had been given on alternate days, must have removed only a little of the most advanced part of the accumulated material. In spite of this the patient had no symptoms which could be ascribed to the fæcal accumulation, and, except for the paralysis, he looked and felt in excellent health.

On February 24 and February 25 the patient's rectum was washed out in the morning, half a pint of oil having been injected the previous evening and retained during the night. On both occasions large quantities of fæces were evacuated, and after the second irrigation fæces could no longer be felt in the colon or the rectum.

On February 26 a bismuth breakfast was given; the cæcum and part of the ascending colon were visible with the X-rays in four hours (Fig. 19), and after ten hours the shadow of the first part of the transverse colon was also seen. The next morning no enema was given and the patient's bowels were not opened, but the whole of the colon from the cæcum to the lower end of the iliac colon was visible.

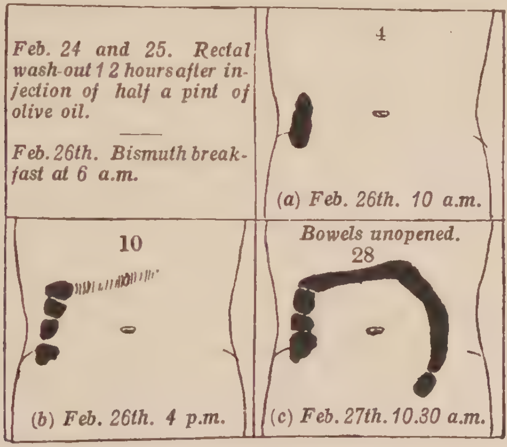

Feb. 24 and 25. Rectal wash-out 12 hours after injection of half a pint of olive oil.
Feb. 26th. Bismuth breakfast at 6 a.m.
4
(a) Feb. 26th. 10 a.m.
10
(b) Feb. 26th. 4 p.m.
Bowels unopened.
28
(c) Feb. 27th. 10.30 a.m.

FIG. 19. Constipation due to fæcal obstruction in Landry's paralysis.

The passage of fæces through the colon was therefore normal in rate, and there was no paralysis of the intestines. On February 28 and on most subsequent mornings the patient opened his bowels without the aid of enemata or medicine.

The retention of fæces in this case was probably primarily due to dyschezia, the patient having been unable to defæcate during the first few weeks of his illness, owing to the complete paralysis of his abdominal muscles. The enemata did not act properly, so that each day a small quantity of fæces was left behind, with the result that, by the time the power of the abdominal muscles began to return, a considerable quantity of fæces had collected. It requires strong muscles to get rid of hard dry fæces, such as those which were present in the patient's colon and rectum, so that he still remained unable to open his bowels without the aid of an enema. Every day a small addition to the mass of accumulated fæces must have occurred, each enema removing less than was added since the last one was given. Hence a condition of fæcal obstruction following on constipation was produced. On getting rid of the accumulation by irrigation of the colon, the obstruction was removed, so that fæces of normal consistency reached the rectum after a normal interval, and the abdominal muscles were sufficiently strong to make voluntary defæcation possible.

(δ) *Deficient fat.*—In addition to the chemical stimulus to intestinal activity produced by fat and the products of its digestion, its presence in the food tends to soften the fæces, as a small quantity, all of which is fluid at the body temperature, always remains unabsorbed. Hence the presence of fat in the diet helps to maintain the regularity of the bowels, and its absence is occasionally a factor in the production of constipation.

(*b*) **Obstruction by non-fæcal matter.**—It is exceedingly rare for true *foreign bodies* to produce obstruction of the colon. If they are able to traverse the œsophagus, pylorus and ileo-cæcal valve, they can reach the rectum without difficulty. Even when arrested at the ileo-cæcal valve, they are more likely to give rise to symptoms of ulceration and perforation than of obstruction. Thus only one case of obstruction by a true foreign body occurred among 669 cases of intestinal obstruction at the London Hospital (Barnard).

Very rarely foreign bodies, such as wool or hairs, drugs or unchewed lumps of food, lodge in the end of the ileum or in a saccule of the large intestine, where they form a nucleus, round which a mixture of dry fæces, mucus and insoluble calcium and magnesium salts accumulates. The *concretions* or *enteroliths* thus produced generally, however, give rise to inflammatory symptoms before any obstruction occurs.

Gall-stones may lodge at the end of the ileum ; but, as the onset of the intestinal obstruction they produce is almost always acute, they cannot be regarded as even a rare cause of constipation.

CHAPTER II

NARROWING OF THE INTESTINAL LUMEN

As the constipation, which is a result of spasmodic contraction of the intestines, has already been described, that due to organic obstruction will alone be considered here. In œsophageal and pyloric obstruction, and in the comparatively rare cases of obstruction of the small intestine, constipation occurs because insufficient material to form a proper quantity of fæces reaches the colon ; in such cases the constipation results from insufficient stimulation of intestinal activity. When the obstruction is situated in the rectum or at the pelvi-rectal flexure it leads to difficulty in defæcation rather than in the passage of fæces through the intestine, so that such cases are properly included under the head of dyschezia.

The diminution in the intestinal lumen, which results in constipation by obstructing the passage of fæces to the pelvic colon, may be due to (*a*) organic stricture, (*b*) kinking, (*c*) pressure exerted from without, and (*d*) intussusception. Unless the obstruction is produced by a palpable tumour, it may be very difficult to distinguish these conditions from constipation due to other causes. The X-rays, however, often afford considerable help. If the colon is previously emptied as thoroughly as possible by means of enemata, the shadow of the colon becomes clear as far as the seat of the obstruction, beyond which little or no bismuth passes for a considerable time. In some cases the actual diminution in the intestinal lumen can be observed as a narrowing o the shadow.

(*a*) **Organic stricture.**—1. *Congenital stricture.*—Congenital narrowing of the intestinal lumen is exceedingly rare; complete occlusion of the rectum or duodenum, giving rise to serious symptoms during the first few days of life, is much more frequently found. Mayo[1] has described a form of constipation, which is due to *congenital narrowness of the ileo-cæcal aperture.* It is always associated with pain in the right iliac fossa, very suggestive of chronic appendicitis, and was only recognized when the appendix was found during an exploratory operation to be normal. A correct diagnosis might possibly be made by observing unusual density of the shadow of the end of the ileum, seen with the X-rays five hours after a bismuth meal. Dr. W. J. Mayo tells me (December, 1908) that he has now operated on eleven cases by widening the ileo-cæcal aperture by a plastic operation, and all have made good recoveries ; the two reported in 1900 are both quite well. The rarity of the condition is shown by the fact that it only formed one-twelfth per cent. of the 15,000 abdominal operations performed by the Mayos between 1900 and 1908.

2. *Acquired non-malignant stricture.*—Acquired non-malignant stricture of the colon is very rare, only 4 out of 669 cases of intestinal obstruction in the London Hospital between 1893 and 1905 being due to this cause (Barnard[2]). It is most unusual for a stricture to result from the cicatrization of dysenteric, stercoral or typhoid ulcers, and syphilitic strictures never occur except in the rectum. The healing of tuberculous ulcers occasionally leads to multiple strictures, especially of the small intestine, and frequently the obstruction thus produced is complicated by the adhesions, which result from the co-existing tuberculous peritonitis. Very rarely obstruction is due to a hyperplastic tuberculous infiltration of the intestine, generally in the ileo-cæcal region ; the condition is clinically very difficult to distinguish from carcinoma.

3. *Malignant stricture.*—The only common cause of organic stricture of the colon (excluding the rectum) is cancer. Primary columnar-celled carcinoma is a very important cause of constipation. It attacks men and women with equal frequency ; it is most common between the ages of 40 and 65, although cases have been recorded of its occurrence in early childhood. Only 15 of 481 cases of intestinal carcinoma in the London Hospital between 1900 and 1905 were situated in the small intestine, and of the remaining 466 no less than 103 (22 per cent.) were in the sigmoid flexure and 278 (58 per cent.) in the rectum. Of the 95 in

the rest of the large intestine, 41 were in the cæcum or ileocæcal region, 6 in the ascending colon, 3 at the hepatic flexure, 17 in the transverse colon, 12 at the splenic flexure, and 6 in the descending colon (Barnard).

Extension to the peritoneum and secondary deposits in the lymphatic glands, liver and other organs occur later and rather less frequently with cancer of the intestine than with cancer in most other situations. The prospect of a radical cure by operation, if an early diagnosis is made, is therefore comparatively good, even when large portions of the intestine are involved.

Constipation occurs earliest in the common annular form of intestinal cancer, which narrows the circumference of the bowel while the actual size of the growth is still very small. Less obstruction is caused by papillomatous carcinoma, which forms a friable and ulcerated mass, projecting into, but not obliterating, the intestinal lumen.

Constipation is frequently the earliest symptom of cancer of the colon. At first it is intermittent and is relieved by purgatives, which gradually become less effective and cause much pain. Enemata are generally of use for a longer period, but they also finally fail to act. Sometimes, however, there is persistent or morning diarrhœa from the start, especially when the growth is situated low down in the intestine. More frequently the initial constipation is interrupted by attacks of diarrhœa. Occasionally spontaneous relief follows ulceration of a projecting mass of growth. In the majority of cases the constipation becomes steadily more severe until it ends in complete obstruction, which is sometimes hastened by the impaction of a hard mass of fæces in the narrowed lumen. It is thus important to think of the possibility of cancer of the intestine, whenever an individual above the age of forty, whose bowels have previously been regular, develops, without change of diet or habits, constipation or diarrhœa. A growth of the intestine may of course develop in constipated individuals, so that a long history of constipation does not in any way make a diagnosis of cancer less probable.

The stools do not generally differ in shape from those seen in ordinary constipation. Occasionally thin pieces, resembling the fæces formed in some cases of spastic constipation, are passed, especially when the growth is in the pelvic colon or rectum ; they probably owe their shape to spasm of the anal sphincter, produced reflexly by the growth or by the irritating discharge from its surface. There is frequently mucus in the stools, owing to the associated catarrh of the colon. Pus, often only recognizable with the aid of the microscope, is generally present.

Blood is rarely passed in large quantities, but the fæces are not infrequently stained dark red or black, or streaks of blood are seen in the evacuation. In a much larger proportion of cases, however, the presence of blood can be proved by chemical means. The occurrence of this ‘ occult ’ blood in the stools is an important early diagnostic symptom of a growth of the colon. The test is so delicate that the blood present in meat is sufficient to give the reaction ; the patient should therefore take only farinaceous food for some days, and the first two stools passed after the change in diet should not be examined. A small quantity of fæces is rubbed with glacial acetic acid in order to convert any blood pigment present into acetate of hæmatin, which is the only substance giving the colour reaction, which is soluble in ether. Ether is added to the mixture, and the extract is then poured off and a few drops of tincture of benzidine or tincture of guaiacum, together with some hydrogen peroxide, are added to it. A blue colour appears if any trace of blood is present in the fæces. In the absence of hæmorrhoids and of bleeding from the mouth, throat and nose, a positive reaction is strong evidence that ulceration is present in the stomach or intestines. When symptoms pointing to gastric or duodenal ulcer and gastric carcinoma are absent, and constipation is present, a suspicion of cancer of the intestine receives important confirmation.

There may be vague abdominal discomfort, but actual pain is rare until the obstruction is almost complete or local or general peritonitis has occurred. Slight attacks of colic occur when the constipation becomes severe, but they reach their greatest intensity when the obstruction is complete.

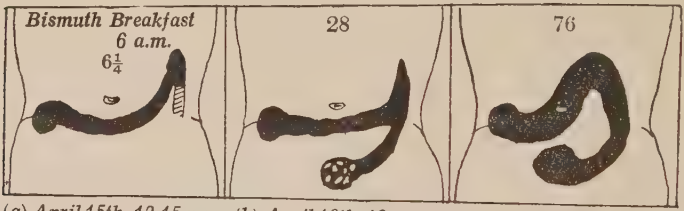
The over-activity of the colon above the obstruction leads to hypertrophy of its musculature, which is often atrophied below. When the obstruction becomes complete, failure of the muscle naturally results, and extreme paralytic distension occurs, and ulceration and perforation, especially of the cæcum, may follow.

When the obstruction is sufficient to give rise to colic, strong peristalsis and spasmodic contractions of the intestine are often visible and palpable. They never occur in the colic associated with lead poisoning or colitis, and only very rarely with obstruction due to simple impaction of fæces.

General symptoms of cancerous cachexia may be completely absent ; they are most marked when the growth is extensive or much ulcerated, and when frequent small hæmorrhages have occurred. Progressive loss of weight and strength and increasing anæmia are the chief general symptoms ; the appetite is generally diminished, but the occasional association of a good appetite with progressive emaciation is, in the absence of pyrexia, very suggestive of a growth.

In about 40 per cent. of cases a tumour is palpable when the patient is first seen. In some of the remainder the growth is inaccessible to palpation, owing to its situation at the hepatic or splenic flexure ; more frequently the tumour is too small to be palpable. If acute obstruction is not an early occurrence, the growth develops into a large and easily palpable tumour, which projects into the intestinal lumen as a fungating ulcerated mass, and invades the neighbouring peritoneum and viscera. The tumour often varies in size from time to time, as it is formed not only by the growth itself, but partly by impacted fæces or by thickened peritoneum and adherent coils of intestine, with perhaps a localized abscess. The disappearance of a tumour after treatment with purgatives or enemata does not therefore mean that cancer is absent, even if its disappearance is associated with improvement in the symptoms. For a mass of fæces may become impacted above a cancerous stricture and produce obstruction, which is greatly diminished when the fæces are removed. A diagnosis of cancer can only be excluded when the disappearance of the tumour is accompanied by complete and lasting cure of all the symptoms. The tumour due to a growth is hard; it is rarely tender, unless peritonitis is present. When situated in the ascending or the descending colon it is generally fixed; in the transverse colon it is frequently very movable.

Case 12. *Constipation due to cancer of the pelvic colon.*—Emma V., aged 49, was admitted into Guy's Hospital on April 11, 1908, under Mr. Golding-Bird. For many years she had suffered from constipation, which had become much worse since the previous November; she was relieved by medicine until three weeks before admission, but during this period her bowels had not been open at all. Every three or four weeks during the last year and a half she had had attacks of violent pain in the lower part of the abdomen, accompanied by retching and vomiting; the last attack had begun three weeks before and continued with slight intermissions ever since.



(*a*) *April 15th. 12.15 p.m.* (*b*) *April 16th. 10 a.m.* (*c*) *April 18th. 10 a.m.*

Fig. 20. Constipation due to cancer of the pelvic colon.

On admission, her abdomen was found to be distended, but no tumour could be felt by abdominal or rectal examination. A very small quantity of fæces was present in the rectum, which was not ballooned. Active contractions of the whole of the colon could be seen and felt during the attacks of colic.

On April 15 the patient was given a bismuth breakfast; in four hours the cæcum was just visible, and two and a quarter hours later the cæcum, transverse colon and part of the descending colon were already seen (Fig. 20). The cæcum passed directly into the transverse colon, there being no ascending colon. Ten hours after the meal no further advance was noticed, but the shadow was deeper and the shape of the transverse colon had altered.

The next morning, April 16, the distended colon was visible up to the end of the pelvic colon, in which churning of gas with fæces could be clearly seen. In the afternoon the patient had severe colic, and very active movements of the contents of the large intestine could be observed. At one moment the cæcum and transverse colon were seen and the descending colon was invisible ; then the shadow suddenly rushed towards the obstruction in the pelvic colon, leaving the cæcum and transverse colon empty. The next moment the bismuth had rushed back to the cæcum again. Whilst this was going on, different parts of the colon could be readily felt to rise up and contract into hard cords. The patient was then given belladonna, with the result that the pain disappeared completely. Two days later, on April 18, the colon was seen to be much more dilated, but no trace of bismuth had penetrated beyond the point of the pelvic colon, which had been reached on the morning of the 16th (Fig. 20 *c*) ; no active movements were visible.

These observations, combined with the clinical picture, showed that the patient had in all probability an organic obstruction of the pelvic colon. The descending colon was reached six and a quarter hours after the bismuth meal was taken, though the cæcum was hardly visible in four hours. Hence the passage through the small intestine was normal in rate, but the colon was traversed with unusual rapidity. This case gives evidence from human pathology in support of the observations of Bayliss and Starling, which showed that in animals mechanical irritation of the intestine—represented here by the obstruction—produces active peristalsis in the few inches of the intestine immediately above; the relaxation, which they showed to occur below the irritation, is perhaps the cause of the ballooned condition of the rectum often observed in similar cases. The change in shape of the colon on different days must have been due to the violence of the contractions moving the whole intestine from its position of rest. The great differences in diameter depended upon whether at the moment of examination the colon was dilated owing to the accumulation of gas and fæces behind the obstruction, or whether it was attempting to overcome the obstruction by a violent contraction. When the patient was under the influence of belladonna and no longer had any colic, as on April 18, the dilatation was most obvious.

The rapid backward and forward movements seen on the afternoon of the 16th show with what speed the intestinal contents can be propelled when an obstruction is present. Not more than a second was occupied in the passage of the contents of the pelvic colon into the proximal end of the transverse colon. Whatever the actual cause of the movements may be, this observation shows that the fæcal vomiting of intestinal obstruction may be due, as formerly believed, to transportation of material from just above the obstruction, and not merely, as Barnard and other recent writers teach, to decomposition of stagnant material in the stomach and duodenum. It can easily be imagined that, when the cæcum is greatly distended owing to obstruction of the colon, the ileo-cæcal sphincter becomes incompetent, just as in dilatation of either ventricle of the heart the auriculo-ventricular valve becomes incompetent and regurgitation results. If such incompetence of the ileo-cæcal valve occurs, there is no reason why the rapid retrograde movement seen in the whole of the colon should not extend to the small intestine and give rise to fæcal vomiting.

The actual cause of the rapid movements of the contents of the colon is not quite clear. No definite peristaltic wave in either a forward or backward direction was seen accompanying the movements of the shadow. Nor was the appearance suggestive of an axial reflux such as occurs in the stomach, where the stream produced by peristalsis is opposed by the closed pylorus, or in the ascending colon of animals, where that produced by antiperistalsis is opposed by the ileo-cæcal sphincter. The sudden change noticed on palpation from a dilated tube to a contracted cord, which can hardly have possessed any lumen at all, suggests that the obstruction gave rise to violent spasmodic contractions of various lengths of intestine above it, which caused their contents to be squeezed partly forward and partly backward, the preponderating direction depending on the distance of the contracted intestine from the obstruction. The sudden disappearance of part of the colon shadow and the simultaneous reappearance of other parts support this view. Nothnagel[3] laid great stress on the importance in the diagnosis of obstruction of this 'stiffening' of the intestine, which is produced by a kind of tetanic contraction and is quite distinct from peristalsis.

The patient's bowels were opened by an enema the morning after her admission. In spite of the daily use of enemata they were not again opened before the operation performed by Mr. Golding-Bird on April 23. A cancerous obstruction was found in the pelvic colon, which was too adherent for removal, so a colostomy was performed.

(*b*) **Kinking of the intestines.**—Kinking of the intestines has been regarded as one of the causes of (1) congenital constipation, and also of the constipation associated with (2) visceroptosis and (3) peritoneal adhesions.

(1) *Constipation due to congenital kinks of the intestines.*—Although the ascending and the transverse colon of the new-born are quite short, the whole length of the colon is three times the length of the infant. This is due to the relatively excessive length of the pelvic colon. When it is unusually long, it becomes bent on itself once, twice or three times, and the flexures may be so sharp that obstruction to the passage of fæces occurs. In 1869 Jacobi first drew attention to the subject, and he subsequently[4] came to the conclusion that an abnormally long pelvic colon was one of the most common causes of constipation in infants. Natural recovery from the constipation occurs between the fifth and seventh years, owing to the growth of the pelvic colon being relatively slow. In very severe cases the obstruction produced by the kinks may be complete, so that no meconium is discharged even with the aid of enemata until several days after birth. Thus in Jacobi's first case, the infant vomited from the first day after birth and no meconium was passed, although the rectum and anus were normal. The abdomen became distended, and finally laparotomy was performed and the colon opened. Some days later death occurred from peritonitis. At the autopsy the pelvic colon was found to consist of three flexures, the lowest being compressed and empty except for a little mucus. The middle flexure also contained mucus, but the uppermost was the only one which contained meconium. It was clear that obstruction

had occurred from kinking due to the excessive length of the pelvic colon.

(2) *Constipation and visceroptosis.*—Kinking of the intestines is generally supposed to be the cause of the constipation, which is so frequently associated with visceroptosis. My X-ray observations have shown, however, that this explanation is only rarely the correct one. Much more frequently dyschezia is produced as a result of the weakness of the abdominal muscles, which gives rise to the visceroptosis, the passage of fæces through the colon being often normal in rate. The subject will be more fully discussed in a later chapter.

(3) *Constipation and peritoneal adhesions.*—Ever since 1853, when Virchow [5] first drew attention to the occurrence of localized chronic peritonitis, many authors have regarded it as a frequent cause of constipation. Virchow described it as occurring, amongst other situations, in the neighbourhood of the hepatic and splenic flexure of the colon, where the chronic peritonitis produced adhesions between the hepatic flexure and the liver, gall-bladder, pylorus or omentum, and between the splenic flexure and the spleen, diaphragm or omentum. These adhesions, he believed, led to dislocation and kinking of the colon and to partial narrowing of the intestinal lumen.

Localized chronic peritonitis was observed by Virchow so frequently in patients of all ages that he experienced difficulty in finding bodies, on which to demonstrate the normal relations of the peritoneum. He believed that it might even be produced in intra-uterine life, as in an infant one week old he found reddish vascular adhesions near the hepatic flexure.

Virchow thought that the condition was sometimes produced by external injury, but most frequently by spread of inflammation from the hollow abdominal viscera. In other cases he believed that hard fæcal masses in the colon, especially at the cæcum and flexures, led by mechanical irritation to the same result without injuring the mucous membrane. He thus regarded the relation of localized chronic peritonitis to constipation as twofold, accumulation of fæces being an important cause of localized chronic peritonitis, which in turn produced a mechanical obstruction to the passage of fæces.

Virchow, writing in 1853, expressed his astonishment that such a common condition as localized chronic peritonitis had up to that time aroused so little attention; it is also remarkable that until quite recently very few further observations of any value were made on the subject. This is due to the fact that, at any rate in England, the pathologist generally examines the viscera after they have been removed from the abdomen by an attendant, so that the peritoneal relations are destroyed and most of the adhesions are divided.

In a series of papers, the first of which appeared in 1901, Arbuthnot Lane[6] recorded the observations he had made on the subject during abdominal operations on constipated individuals. He described adhesions similar to those observed by Virchow, and he considered their most frequent cause to be the condition found in constipation of 'overloading of the large bowel and of that portion which serves more especially as the cesspool of the gastro-intestinal tract, namely, the cæcum and ascending colon'. Corresponding with this, he found that the hepatic flexure was the part most often seriously involved. He believes that the adhesions produced by localized chronic peritonitis are an important factor in the production of constipation, as they lead to atrophy of the intestinal musculature and to obstruction from dislocation, kinking and narrowing of the lumen of the bowel.

It is clear from Lane's observations that peritoneal adhesions may be present in constipated individuals. But in order to prove a causal connexion, it is necessary to inquire into the frequency of their occurrence in people whose bowels act regularly. Virchow's observations could only be explained on the assumption that adhesions exist in other than constipated individuals, and this has been still more conclusively proved by the recent investigations of Mollison and Cameron[7] in fifty consecutive autopsies at Guy's Hospital, the age of the subjects varying from three weeks to sixty-eight years, cases of generalized peritonitis being alone excluded from the series. They found that peritoneal adhesions were present in all adults and older children, and in eleven of the seventeen children under five years, including one of three weeks. They were more numerous, stronger and denser in adults than in children, and in the six fœtuses examined adhesions were entirely absent. They were sometimes found round the pylorus and gall-bladder, but more frequently in connexion with the large intestine. The small intestine was never involved, with the exception of the last few inches of the ileum. Adhesions were frequently found in connexion with the cæcum, but only twice with the appendix. In fourteen cases there were well-marked bands passing from the ascending colon to the transverse colon, so as to fix the flexure at a very acute angle. The transverse colon was generally otherwise free from adhesions, which were also infrequent at the splenic flexure and in the descending colon. The iliac and the pelvic colon were sometimes the seat of dense adhesions, but less often than the cæcum and ascending colon.

Owing to the constancy of the occurrence of these adhesions in adults and their frequency in children under five years old, Mollison and Cameron conclude that it is impossible for them to be either the cause or the result of chronic constipation.

The most frequent situation of adhesions, according to both Lane and Mollison and Cameron, is round the ascending colon and hepatic flexure, although with the X-rays I have rarely found, even in the severest cases of constipation, any prolonged stagnation in the passage of the intestinal contents before the middle of the transverse colon is reached. I have frequently seen an apparently sharp bend at the hepatic flexure with the X-rays in both normal and constipated individuals, but I have only once, in Case 6, observed any serious delay in the passage of the intestinal contents at this point, and in that case the delay was not due to a kink and was overcome by simple dietetic measures.

At autopsies, in the dissecting-room and at abdominal operations such a thing as a loaded cæcum is never seen;

unless there is some obstruction in the colon, the cæcum is nearly always empty. Mollison and Cameron found solid fæces in the cæcum in only three out of thirty-three bodies examined after death. I have asked the surgeon to examine the condition of the cæcum in all of the considerable number of operations in cases of acute appendicitis which I have watched in the last two years, and in every instance it was found to be completely empty. In one case the cæcum was opened by mistake ; it was so completely empty that the surgeon took its smooth mucous membrane to be peritoneum, and only recognized after a few minutes that he was exploring the cæcum and not the peritoneal cavity. Observations made in cases of chronic constipation and of appendicitis by means of auscultation and percussion have shown me that in these conditions the amount of material present in the cæcum is much the same as in health. That is to say, the cæcum is invariably empty in the morning and begins to fill about four hours after breakfast. The overloading of the cæcum and ascending colon with fæces in constipation is thus a myth, and to call these parts of the large intestine a cesspool is to insult without reason an important part of the alimentary canal.

It may therefore be concluded that localized chronic peritonitis is rarely produced by constipation, and that the adhesions which result from chronic peritonitis only very rarely produce any permanent delay in the passage of fæces through the colon. Most of the adhesions observed by Lane, when operating on constipated individuals, can only be accidentally associated with the constipation. In a series of patients with no constipation it is probable that adhesions, if looked for, would be found in almost equal number.

Dyschezia, however, is sometimes produced by adhesions resulting from localized pelvic peritonitis ; this will be discussed in the next chapter. In very exceptional cases adhesions between the colon and a kidney may lead to kinking of the former if the latter becomes movable (*vide* p. 193).

The following is the only case I have yet observed, in which it seemed to be clearly proved that kinking of the colon, elsewhere than at the pelvi-rectal flexure, produced constipation.

Case 13. *Constipation due to obstruction caused by a kink at the splenic flexure.*—Florence D., aged 31, unmarried, had suffered from constipation since childhood, and for some years had been much troubled with abdominal pain. Treatment for many weeks as an out-patient and as an in-patient by drugs, massage and diet had produced but little improvement.

On admission the rectum was empty and no fæcal accumulation could be felt in any part of the colon. Skiagraphic examination (Fig. 21) showed that the cæcum was reached in four hours and that the ascending colon and greater part of the transverse colon were visible after ten hours. The next morning the bismuth had reached the end of the transverse colon, and the descending colon could be seen filled with gas, but containing no fæces. On the third morning the bismuth had advanced no further, and on the fourth it was found that a few small masses of fæces had reached the descending colon, but otherwise the appearance was unaltered. On the fifth and sixth mornings after the meal there was no change. An enema was given on the sixth morning with a good result, the bowels not having been opened since the day before the bismuth meal. On the seventh morning after the bismuth breakfast was taken, an enema was again given with success, and the cæcum was found to be almost empty, but the transverse colon was still well filled. No further skiagraphic observations could be made without incurring danger of producing an X-ray burn.

The splenic flexure was thus reached after a normal interval, but at the end of a week only very little bismuth had passed into the descending colon. There was thus a definite obstruction at the splenic flexure, produced by a kink, the transverse colon joining the descending colon at a very acute angle. This would explain why the rectum was empty even a week after the bowels had last been opened.

After the conclusion of the X-ray examinations the patient was given a daily enema, her bowels being regularly opened by this means. Four weeks later, when the danger of a burn from the cumulative effects of the previous X-ray examinations had disappeared, a pint of water containing two ounces of bismuth carbonate was run slowly into the colon *per rectum* at a pressure of one foot. It could be seen with the X-rays to pass the splenic flexure without difficulty, and it reached the cæcum in a couple of minutes (Fig. 21 *g*).

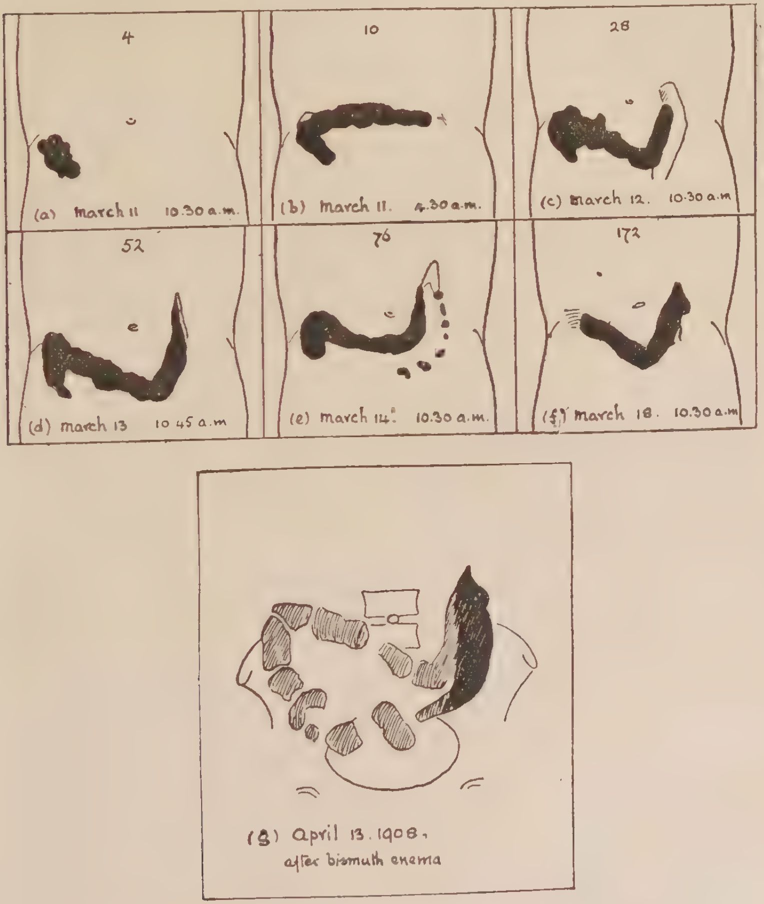


FIG. 21. Constipation due to obstruction caused by a kink at the splenic flexure.

Thus the kink at the splenic flexure, though sufficient to form a very complete obstacle to the passage of fæces in the normal direction, had no effect in preventing the passage of fluid in the opposite direction. Enemata were successful in this case, as they were able to pass the kink, the sharpness of which they were probably able to diminish. The water, which reached the transverse colon, stimulated peristalsis by the distension it produced, so that some of the contents of the transverse colon were forced beyond the splenic flexure, the acuteness of which was temporarily diminished by the enema. When once in the descending colon, there was no further obstacle to the passage of the fæces.

The patient was again seen a year after her discharge from the hospital. Her bowels still acted quite regularly with the aid of enemata, and her general health had greatly improved.

This case shows that enemata may be useful in some of the rare cases of kinking of the colon, as well as in dyschezia. These two classes of cases, in which an enema is the only means of procuring a stool, can generally be distinguished from each other clinically without the aid of the X-rays by making a rectal examination, as the rectum is only filled with fæces when defæcation is inefficient.

If in a similar case enemata proved of no help, the rational treatment would be to make a lateral anastomosis between the two limbs of the flexure. This is the only case of a kink producing partial obstruction which I have yet seen, and it is remarkable that the abdominal muscles were moderately strong and that there was only slight visceroptosis, as shown by the X-rays and by the ordinary clinical methods of examination.

(*c*) **Pressure on the intestine from without.**—The intestine is not easily obstructed by simple pressure exerted by some external tumour or organ, unless it is so placed that it can be compressed against a hard surface, such as the pelvic bones, the spine or the ribs. On account of their mobility in the abdominal cavity the small intestine and the transverse and the pelvic colon are rarely obstructed in this way, but the duodenum, ascending and descending colon and rectum, being fixed, cannot always escape.

Owing to the confined space and rigid boundaries of the pelvis and the frequency of tumours of the female genital organs, the rectum is much more liable to obstruction by external pressure than the other fixed parts of the intestines; obstruction of the rectum by pressure from without will be discussed more fully in a later chapter. The ascending and the descending colon may be compressed by tumours of the kidney, liver, gall-bladder and retroperitoneal tissues, by hydronephrosis or cystic disease of the kidneys, by perinephric, intraperitoneal and psoas abscesses. In the majority of cases the pressure is complicated by adhesions and inflammatory or malignant infiltration of the intestinal walls.

(*d*) **Chronic intussusception.**—A form of chronic intussusception, in which the pelvic colon is invaginated into the rectum, will be described under the head of dyschezia. Chronic intussusception occurring in other parts of the intestines is a rare cause of constipation in adults, which may last for a month, a year or longer, before it terminates in an attack of acute obstruction or of general peritonitis from perforation; in one-third of the cases the intussusception reaches the anus, from which it may project for some inches without preventing the passage of fæces. The onset is generally insidious; occasionally it is acute, but the severity of the symptoms generally diminishes and the subsequent progress of the case is chronic. Only about one-half of the cases are accompanied by constipation, diarrhœa being present in the majority of the others. The symptoms are on the whole similar to those produced by a stricture of the intestine. The most prominent is colic, occurring in attacks, which steadily increase in frequency and severity and which may be brought on by food or aperients; constipation is present during the attack, and blood and mucus may be passed at frequent intervals in enterocolic and colic intussusceptions, but not in enteric. A palpable tumour is present in half the cases; it becomes harder and longer during an attack of colic, and appears to recede in the intervals. Severe attacks are accompanied by vomiting, especially in the enteric form. Visible peristalsis and dilatation often occur in the intestines above the intussusception.

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[1] W. J. Mayo: *Annals of Surgery*, xxxii, 364, 1900.

[2] H. L. Barnard: *Intestinal Obstruction*, in Allbutt and Rolleston's *System of Medicine*, iii, 704, second edition, 1907.

[3] H. Nothnagel: *Diseases of the Intestines*, Eng. Trans., pp. 75 and 363, 1904.

[4] A. Jacobi: *New York Med. Record*, xlv, 613, 1894.

[5] R. Virchow: *Virchow's Archiv*, v, 281, 1853.

[6] W. Arbuthnot Lane: *vide* references on p. 157.

[7] W. M. Mollison and H. C. Cameron: *Guy's Hospital Reports*, lxii, 143, 1908.

CLASS II

DYSCHEZIA

The second of the two great classes of constipation, for which I have proposed the name of 'dyschezia', is that in which there is inability to defæcate completely. The X-rays show that the passage of fæces through the intestines in uncomplicated cases is normal or even unusually rapid, but the act of defæcation does not empty the part of the bowel, which is beyond the splenic flexure, as completely as it should do. Hence, although the bowels may be opened daily, the fæces may be unduly hard owing to excessive absorption of water during their long retention in the rectum and pelvic colon, or cumulative constipation may result from the slight daily deficiency in the quantity of fæces excreted, compared with the quantity produced. Sometimes an attempt is made to open the bowels several times a day, but very little is passed on each occasion, the rectum being never completely emptied: this is the condition described by Boas as 'fragmentary constipation'.

In severe cases defæcation is not only incomplete, but it does not occur daily, and finally it may become quite impossible to defæcate without mechanical assistance. I have seen a lady, who for six years had to dig out the fæces from her rectum with her fingers every day, as drugs and enemata were absolutely useless.

Dyschezia differs from other forms of constipation in that more or less considerable quantities of fæces are found in the rectum whenever an examination is made, even immediately after defæcation. Ebstein[1] has pointed out that this accumulation is often palpable without a rectal examination by means of a finger pressed deeply into the ischio-rectal fossa. The pelvic colon can generally be felt through the front wall of the rectum to be also filled with fæces, and in some cases a further accumulation is found by abdominal palpation in the iliac and even in the descending colon.

Occasionally the dyschezia may be due to inability to pass the contents of the pelvic colon into the rectum, the evacuation from the rectum, when it is once filled, offering no difficulty. In such cases the rectum is found to be empty, but the fæces in the pelvic colon can generally be felt as a sausage-shaped tumour through the front wall of the rectum. As an abnormal accumulation of fæces may occur in the same situation in the various forms of constipation due to the slow passage of the fæces through the colon, this rare but important group of cases can only be recognized with certainty by means of the X-rays, which show that the intestines as far as the pelvic colon are traversed at the normal rate.

As the activity of the intestines in uncomplicated cases of dyschezia is normal, treatment by diet and purgatives is always ineffective, and operations, such as ileo-sigmoidostomy and colectomy, interfere with a normal part of the alimentary canal without influencing in any way the seat of the disorder. The whole of the rectum and more or less of the pelvic colon being distended with fæces, their evacuation by enemata, or in exceptional cases by the finger or an instrument, alone produces relief and alone offers prospects of an ultimate cure. Chevalier,[2] who seems in 1819 to have been the first to describe this type of constipation, explained how enemata are the only proper treatment, as with purgatives 'the whole intestinal canal is teased and pained, for the defective action of that very part of it which is most remote from their influence'. If the patient has himself discovered that enemata give relief and that purgatives are useless, a clue to the diagnosis is already given by the history before any actual examination is made. This is not, however, an entirely reliable guide, as when a large accumulation of fæces has occurred as a result of any form of constipation, enemata produce a better evacuation than purgatives until the accumulation has been completely removed.

Dyschezia is due to a want of proper relation between the power of expelling the fæces from the pelvic colon and rectum and the force required to do this completely. It may therefore be due to (A) inefficient defæcation, or (B) an obstacle to efficient defæcation.

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[1] W. Ebstein: *Die chronische Stuhlverstopfung*, p. 34. Stuttgart, 1901.

[2] T. Chevalier: *Med.-Chir. Trans.*, x, 400, 1819.

SECTION A

INEFFICIENT DEFÆCATION

Inefficient defæcation is due in the majority of cases either to (1) habitual disregard of the call to defæcation or (2) inefficiency of the voluntary muscles, which normally take part in defæcation. Both conditions lead finally to the same results—the complete loss of the defæcation reflex and atony and paresis of the musculature of the rectum and pelvic colon. These are more directly results of the habitual disregard of the call to defæcation than of inefficiency of the voluntary muscles concerned in the act, so they will only be considered in detail in the description of the former condition. (3) Defæcation may also be inefficient owing to the assumption of an unsuitable posture during the act. (4) Weakness of the defæcation reflex is occasionally the primary cause of constipation in infants, and it is also the cause of the constipation which may occur in various organic diseases of the nervous system. Finally, (5) hysterical constipation is in most cases due to dyschezia.

CHAPTER I

HABITUAL DISREGARD OF THE CALL TO DEFÆCATION

When for any reason the uncomfortable sensation of weight in the perineum produced by the entry of fæces into the rectum, which constitutes the call to defæcation, is disregarded, it generally passes off after a short time, but sometimes only after the occurrence of a little colicky pain. The call to defæcation generally returns once or twice during the day more or less urgently, but, as it is very likely to occur at a time and place where it cannot be obeyed immediately, it is often again neglected. Reasons have already been given (p. 36) for believing that, when the desire to defæcate passes off, the fæces do not return from the rectum to the pelvic colon. The absence of any urgent desire to defæcate, in spite of the presence of fæces in the rectum, shows that the sensibility of the mucous membrane must become very easily blunted by prolonged contact with fæces. On the morning following that on which a call to defæcation has remained unanswered the desire generally returns, but it is not likely to be so strong as usual, so that more voluntary effort is required to initiate the reflex. If, however, the call be again disobeyed, the foundations will have been laid for more or less permanent dyschezia. Every time the act is postponed the rectum becomes less sensitive; in fact it is trained to disregard the irritation produced by the presence of fæces, and even when it is loaded with hard fæces, the patient may not feel the slightest desire to defæcate.

The habitual neglect of the call to defæcation leads to the accumulation of fæces in the rectum and pelvic colon, which become gradually more and more distended. The distension diminishes the tone and impairs the contractility of the musculature; as the force required to empty the rectum, when overdistended with fæces, is much greater than that required to empty it under normal conditions, the weakened muscular coat is incompetent to do its work, and, even if a great effort be made, the evacuation remains incomplete.

In time the musculature of the pelvic colon and rectum may become so profoundly atonic and paretic, that it can never be completely restored to its normal condition.

The result of putting off defæcation was well seen in one of the normal individuals examined in our study of the process of defæcation. At 9 a.m. he felt, as usual, the desire to defæcate, but he had at 11 p.m. on the previous evening taken a bismuth meal and wished to give us the opportunity of examining his colon before and after defæcation. He therefore restrained the desire, which at one time was sufficient to produce some colicky pain. By 9.30 a.m. the desire to defæcate had disappeared. On examination at 10 a.m. no shadow was seen in the colon, except in the iliac and pelvic parts, the latter being considerably distended. Under normal conditions the whole colon could be seen in this individual after ten hours; the voluntary inhibition of defæcation must therefore have led to increased activity of the colon, giving rise to colic and causing it to empty its contents into the pelvic colon and rectum, which consequently became distended. On subsequently defæcating, the distended pelvic colon and rectum were to a large extent emptied, but if no effort had been made and the natural call to defæcation had on future occasions been neglected, they would no doubt have become permanently dilated and lost their tone and contractile power.

The call to defæcation is habitually disregarded for various reasons, the most frequent of which are ignorance and laziness. Regularity in defæcation should be taught from early infancy. In England this important duty is too often neglected by both mothers and nurses. Surgeon-Colonel Pilcher tells me that the rarity of constipation among the natives of India is largely due to the fact that the habit of defæcating at an early hour in the morning is universally taught. The Indian mother supports the buttocks of her infant on her big toes, so that it can defæcate between her feet, and teaches it regular habits in this way from a very early age. As soon as the child can walk, it accompanies its mother to the jungle at or before sunrise. The result of this teaching is seen in the Indian prisons: the moment the dormitories are open at sunrise, every prisoner rushes to the latrine, and by 8 a.m. the whole of the fæces of some two thousand persons has been removed and trenched in the prison garden.

Laziness is a very common cause of dyschezia. A domestic servant, a schoolboy or a business man gets up so late in the morning that there is only time to dress rapidly and have a hurried breakfast before the day's work begins. There is no time to visit the closet after breakfast, or the visit has to be so hurried that the individual must rest content the moment he has passed anything, although there may be a much larger quantity of fæces ready to be evacuated. Sometimes proper use is not made of even the short time spent in the closet, as all the attention is given to a newspaper instead of to emptying the bowels. In other cases the occupations of the day are too few instead of too many: women, who have the whole morning before them with nothing of great importance to do, often put off the unpleasant duty until the inclination to defæcate has disappeared. These are just the sort of people, who will be unwilling to put down an interesting book or interrupt a conversation if, later in the day, the desire to defæcate returns. In this connexion false modesty may be mentioned: a girl or a woman dislikes to leave the room suddenly, especially if the desire is felt at an unusual hour, as she fears that her absence might be associated in the minds of the other people in the room with the unsavoury idea of defæcation.

Defæcation is naturally regarded as an unpleasant necessity. But if the water-closet is uncomfortable, particularly if it smells or is dirty, or is very cold in winter, the visit is not merely unpleasant but repulsive, and many people prefer the discomfort and danger of postponing the act as long as possible to visiting the closet under such conditions. The filthy lavatories so often met with in unfrequented districts are responsible for much of the constipation, which frequently comes on during a holiday, in spite of the greater amount of exercise which may be taken. In country places, where the lavatory is often situated out-of-doors, there is a natural tendency to postpone emptying the bowels in very cold or rainy weather, or when the desire is felt late in the evening or during the night. In many institutions the closets are insufficient in number to meet the demands upon them, so that defæcation has sometimes to be postponed until the desire has considerably waned.

Defæcation is voluntarily inhibited by many people on account of the pain produced in the act, with the result that dyschezia develops and the condition which caused the painful defæcation is often rendered worse. Pain may occur on defæcation, owing to the pressure of hard fæces on a diseased rectal or anal mucous membrane or on adjacent organs which are in a pathological condition. Simple hæmorrhoids give rise to discomfort rather than pain, so that defæcation is not likely to be put off on their account. When, however, they are inflamed or thrombosis has occurred in them, defæcation is very painful. Anal ulcers are the most frequent cause of severe pain during defæcation, the acute pain produced by the passage of a stool, especially if it be hard, being sufficient to make the patient indefinitely postpone defæcation, so that dyschezia results. The passage of a mass of fæces through the rectum produces considerable pain in many cases of pelvic peritonitis and cellulitis, and the pressure on a tender retroverted uterus or on a prolapsed ovary causes a dull sickening pain, which persists for half an hour or more after defæcation.

Case 14. *Severe dyschezia from habitual disregard of the call to defæcation.*—Mabel T., aged 17, has suffered from constipation since she was 10 years old. She says that she has only herself to blame for her present condition, which she ascribes to her former habit of restraining the desire to defæcate. As a little girl she had no time to visit the closet before going to school, and when there she was too shy to ask for permission to retire. When 15 years old she began to work as a dressmaker. By this time she had already become very constipated, but with the aid of medicine she was still able to open her bowels every other day. Unfortunately the desire to defæcate came on during the morning, when she was at work. If she retired, she required a long time to open her bowels, as the mechanism concerned was becoming inefficient. Her companions teased her on account of her long absence, so she no longer obeyed the reflex call to defæcation. This gradually became weaker and the difficulty she experienced, when she attempted to defæcate, increased. Her bowels were now opened only once or twice a week; she was occasionally sick, her appetite was poor, and she always felt slack and unequal to doing any work. The trouble reached a crisis in February, 1907, when she was admitted into Guy's Hospital, as her bowels had then not been opened for five weeks. Her abdomen was somewhat distended and tender, her tongue was dry and furred, and she vomited occasionally. She was given an enema at once, and a large quantity of fæces was evacuated. She remained in the hospital for some weeks and was treated with various purgatives, but her bowels were only opened when an enema was given.

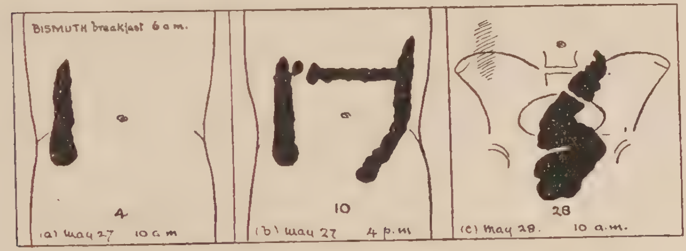


FIG. 22. Dyschezia.

After her discharge she was treated with electrical massage of the abdomen, but no improvement resulted, so on May 24, 1907, she was re-admitted into Guy's Hospital. She still complained of pain in the abdomen, which was somewhat distended and tender. She was occasionally sick and had a very poor appetite. Her complexion was sallow and her expression apathetic. Her bowels were opened by an enema on May 25. After this she was given a full diet but no medicine, and her bowels were not opened again until May 28. On May 27 she was given a bismuth breakfast (Fig. 22), and in four hours the shadow of the cæcum and the whole ascending colon was distinctly visible on the fluorescent screen. Although in normal individuals a shadow is generally present in the cæcum four hours after a bismuth meal, I have never seen it reach the hepatic flexure at so early a period. The passage of food through the small intestine and ascending colon was thus abnormally fast instead of abnormally sluggish, in spite of the constipation. Ten hours after the breakfast, the shadow of the large intestine from the cæcum to the end of the iliac colon was visible ; on only one occasion in the numerous examinations made of normal individuals did the bismuth reach as low as this in the same time, the average point attained being the splenic flexure. The next morning, twenty-eight hours after the bismuth had been taken, it had all accumulated in the greatly distended pelvic colon and rectum, except a small quantity which was still present in the ascending colon. In the majority of normal individuals, if the bowels have not yet been opened, a considerable amount of bismuth is still present in the descending colon and sometimes in the ascending and transverse colon at this period. Thus the passage of the intestinal contents through the colon, as well as through the small intestine, was, in this severe case of constipation, unduly rapid rather than unduly slow.

On the afternoon of May 28, the day after the bismuth breakfast had been taken, the rectum was examined ; it was found to be greatly dilated and completely filled with hard fæces. In spite of this the patient felt no inclination to defæcate, and was quite unable to do so when she tried. The fæces were broken up by the finger and an enema was then given ; a large quantity was evacuated, with the result that the patient experienced considerable relief from the abdominal pain, from which she was suffering. The next morning another enema was given and a further quantity of fæces was passed, but less than on the previous evening. No trace of a bismuth shadow could now be detected with the X-rays, proving that the enemata had removed all the bismuth from the colon.

It is clear that in this case the seat of the constipation was the pelvic colon and rectum. The skiagram showed that the former was dilated ; digital examination showed the dilated condition of the rectum. In normal individuals there is often a little fæces in the rectum, but never sufficient to produce distension, as a desire to defæcate is felt as soon as a moderate quantity is present. In this case the rectum was greatly distended, but the patient experienced no desire to defæcate. The rectum was therefore anæsthetic, and the normal defæcation reflex, which depends upon impulses passing from the rectal wall, could no longer occur. Further, on attempting to defæcate, although a considerable quantity of fæces was present in the rectum, the patient was invariably unsuccessful. This must have been due to paresis of the muscles of the pelvic colon and rectum, brought about by their overdistension, as the rest of the colon was normal, the diaphragm moved well and the abdominal muscles were moderately strong. The patient was thus suffering from dyschezia, which depended on the anæsthesia of the rectal wall and the paresis of the pelvic colon and rectum. The rapid passage of fæces through the small intestine and colon was analogous to that occurring with an organic obstruction, as in Case 12, being due to the increased activity of the gut in its attempt to overcome the obstruction produced by the fæcal accumulation in the pelvic colon and rectum.

The constipation in this case probably started, as suggested by the patient herself, as a bad habit. Ever since the age of ten she had not responded to the first slight sensations, which indicate that it is necessary to defæcate.

The small and large intestines up to the pelvic colon having been shown to act normally, it was easy to understand the failure of previous treatment. This had consisted mainly in the administration of various purgatives, which could hasten the peristalsis of the already over-active small intestine and colon, and in doing so would readily give rise to colicky pains, but would be quite without effect on the paralysed and distended pelvic colon and rectum. Massage also could only have been applied to parts of the intestine which were normal, the abnormal pelvic colon being for the most part out of reach.

Ileo-sigmoidostomy and colectomy would have proved equally useless, as the normal colon would have been put out of action or removed, and part, at any rate, of the abnormal pelvic colon and rectum would have remained unaffected by the operation.

After it was seen that the enemata given on the evening of May 28 and on the morning of May 29 completely removed the accumulated fæces, a daily enema was given to the patient. It was found to produce a normal stool every morning. The patient was kept on full diet and allowed to walk about as much as she pleased. It was hoped that the tone of the pelvic colon and rectum might return by thus keeping them empty ; but although the patient was told to try to defæcate every morning before the enema was given, she was never successful. On June 11, enemata having been administered every day since May 29, a bismuth breakfast was again given. In four hours the cæcum and a small part of the ascending colon were seen with the X-rays, and four and a half hours later the cæcum, ascending colon and most of the transverse colon were visible (Fig. 23). The next morning no enema was given, and at 11 a.m. most of the large intestine from the cæcum to the beginning of the pelvic colon could be seen. At 5 p.m. the pelvic colon was also visible, and was found to be no longer distended. On June 13, at 6 a.m., forty-eight hours after the bismuth breakfast, an enema was given with a good result; at 10 a.m. no bismuth shadow was visible. These observations showed that the pelvic colon was no longer distended, and that with the removal of the fæcal obstruction the stimulus to increased activity of the colon had gone, as the bismuth no longer passed at an abnormally rapid rate through the intestines.

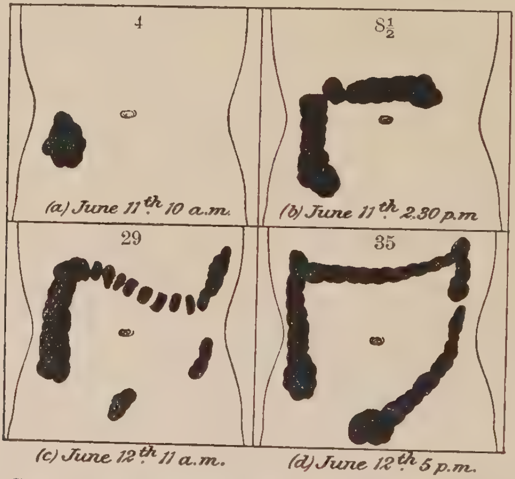


FIG. 23. Case 14, after treatment for a fortnight with daily enemata. Bismuth breakfast at 6 a.m., June 11.

The patient was now almost completely free from pain, and looked and felt much better than she had done for many months. An attempt was made to hasten the recovery of the atonic pelvic colon and rectum by means of intrarectal electrical treatment. This had no appreciable effect after ten days, so it was discontinued. The patient was then discharged from the hospital, and her mother was instructed to give her an enema regularly every day, and to encourage her to try to open her bowels without artificial assistance. Perhaps in course of time the pelvic colon and rectum may regain their lost functions. Meanwhile the patient must continue to have a daily enema—no great hardship if it leaves her with an intact colon and relieved of the pain and other symptoms, which, after seven years of chronic constipation, seemed likely to render her a permanent invalid. If her condition had been recognized at an earlier period, when distension of the rectum still produced the desire to defæcate and the muscles of her pelvic colon and rectum were still sufficiently strong to enable her to open her bowels occasionally without artificial aid, complete recovery would in all probability have occurred. Daily attempts to open her bowels at a specified time and the administration of an enema whenever the attempt failed would probably have resulted in enemata being required less and less frequently, until finally they could have been entirely dispensed with.

I have seen the patient at intervals since her discharge from the hospital, and she has looked and felt much better, though she is still quite unable to open her bowels without the aid of an enema, which she uses on alternate days. This has only on a few occasions failed to act; thus on April 19, 1908, she came to the hospital to say that her bowels had not been open for twenty-four days. In spite of this she did not look ill, but she complained of considerable abdominal pain and tenderness. The rectum was found to be greatly distended with fæces, but none could be felt in the descending or the iliac colon. She was accordingly readmitted into the hospital. Six ounces of olive oil were injected in the evening and retained during the night; the next morning an enema was given and a very large quantity of fæces was evacuated. The following morning an ordinary enema was found to be equally effective. It seems probable that this attack of constipation was due to the inefficient administration of the enemata. The patient should have come for help as soon as a single enema failed to act, instead of waiting for over three weeks. She would then, no doubt, have had her bowels opened by a single skilfully administered enema without requiring to come into the hospital.

In June, 1909, the patient's bowels continued to act regularly with the aid of enemata, without which, however, she was still quite unable to defæcate.

Case 15. *Severe dyschezia of thirty-three years' duration.*—Emily H., aged 54, has been constipated for thirty-three years, during which she has been under continuous medical treatment, privately and as an out-patient; she has also been in the hospital six times for her constipation. In 1892

Mr. Lane performed Whitehead's operation on her for hæmorrhoids, which had been painful and had caused severe hæmorrhage on frequent occasions during the previous twelve years. During these years defæcation had been so painful that she dreaded going to stool, and so, no doubt, aggravated her constipation by not responding to the normal defæcation reflex. In 1898 she was again in a surgical ward for complete constipation of fifteen days' duration. The rectum was found to be distended with fæces. Castor oil, aloes and rhubarb were given without result, and the bowels were not opened until four days later—the nineteenth day of complete constipation—when an enema was administered. The drug treatment was continued, but the bowels were not opened until a second enema was given nine days later. In the same year she was re-admitted into Guy's Hospital under Dr. Taylor, when, for the first time since the trouble began, her bowels were well opened every day by means of enemata, no medicine being given. When discharged she was advised to continue the daily use of enemata, but she did not do so.

In 1899 she was again in the hospital, where she was treated with medicine and occasional enemata : the latter invariably had a good result. The next year she was once more an in-patient for nearly two months, during which she was given large quantities of many different purgatives, and was also treated by abdominal massage and electricity, but her bowels were rarely opened unless an enema was administered.

During the last eight years she has been attending as an out-patient and has regularly taken large doses of purgatives, but her bowels have only been opened once or twice a week, and sometimes only once in two or three weeks, an enema being always required to accomplish this. For short periods, during which she used an enema daily in accordance with Dr. Fawcett's advice, her bowels were regular, but she would never continue the treatment for any length of time.

In June, 1907, she again came into the hospital, complaining of weakness and pain in addition to the constipation. She was depressed and looked anæmic and ill. The lower part of her abdomen was somewhat tender, especially the left side. Nothing abnormal could be felt, except some scybala in the iliac colon. The abdominal muscles were weak, but there were no well-marked signs of visceroptosis.

After an enema had been given with good result, a series of X-ray examinations was made, the patient being kept on a full diet, no medicine or enemata being given. She had a bismuth breakfast on July 2, and her bowels remained unopened until July 9. The cæcum was reached in the normal time, and the progress as far as the beginning of the transverse colon was not delayed (Fig. 24). The next morning, July 3, the cæcum, ascending colon and most of the transverse colon were visible. The latter had a double bend, the first being small and entirely to the right of the umbilicus, the other being large, its convexity reaching low down into the pelvis.

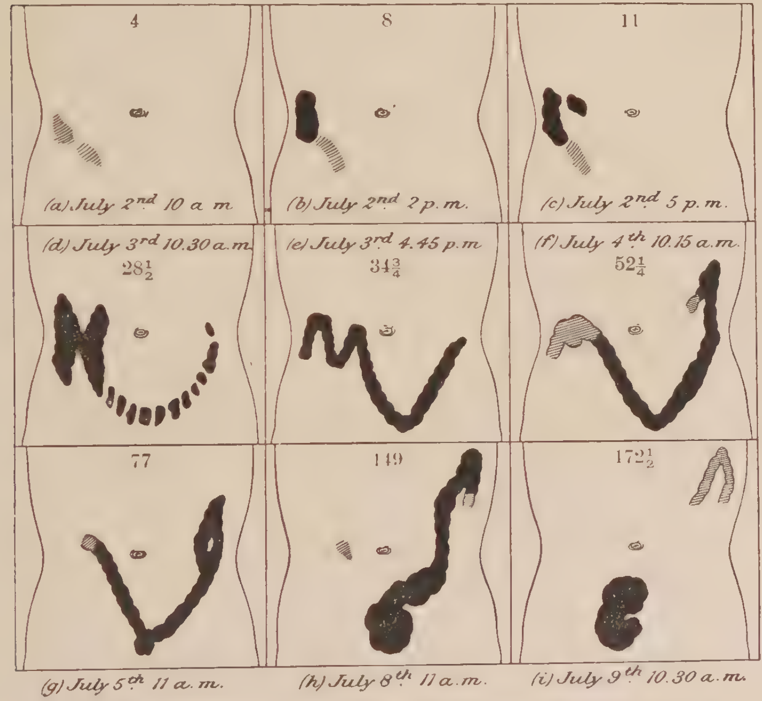


FIG. 24. Severe dyschezia. Bismuth breakfast at 6 a.m., July 2.

On July 4, the second morning after the bismuth breakfast, the cæcum, ascending colon and first loop of the transverse colon were faintly visible. The second loop was well marked, and the shadow now extended to just beyond the splenic flexure. On July 5, the third morning, the cæcum, ascending colon and first loop of the transverse colon were no longer visible, but all the rest of the colon up to the beginning of the pelvic colon could be seen. On July 8, the sixth morning after the bismuth breakfast, there only remained a faint shadow of the last inch of the transverse colon. All the large intestine below the splenic flexure was visible; the iliac colon was seen to be slightly distended, and the pelvic colon and rectum were much distended. On July 9, the seventh morning, a small length of the transverse and descending colon could be faintly seen at the splenic flexure. Otherwise only the distended pelvic colon and rectum were visible. A rectal examination was made and it was found that the internal sphincter was relaxed and the dilated anal canal formed with the rectum a distended sac, filled completely with moderately firm fæces. Immediately afterwards an enema was given and a copious evacuation resulted. A quarter of an hour later the patient was again examined with the X-rays, and every trace of the shadow was found to have disappeared. Hence the enema not only emptied the rectum, but also the colon at least as high up as the splenic flexure.

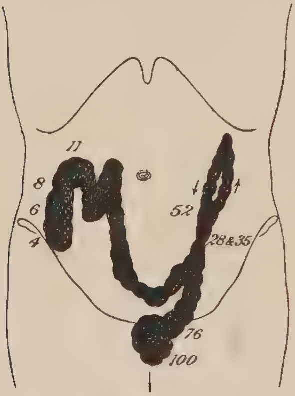
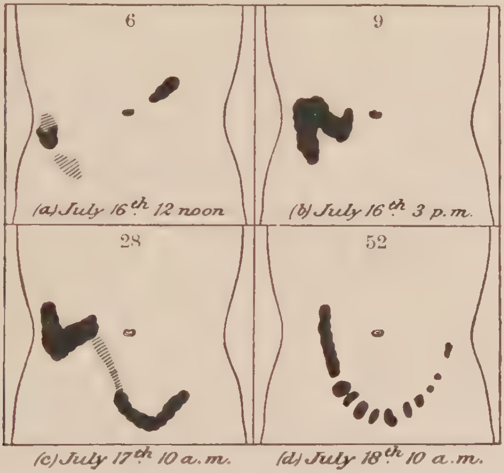


FIG. 25. Severe dyschezia. Composite diagram to show the time in hours, at which the bismuth reached various parts of the colon.

In Fig. 24 the shadows seen at various periods after the bismuth breakfast are reproduced; the shape of the whole colon and the course of the bismuth along it are shown as a composite diagram in Fig. 25.

In this case the bismuth passed through the small intestine at the normal rate and traversed the normal distance in the first twenty-eight hours, but there was considerable delay beyond the splenic flexure. After seven days the bismuth had almost completely disappeared from all the intestines except the distended pelvic colon and the rectum, in which it had accumulated, and, judging from the past history of the patient, it would probably have remained there for weeks, if an enema had not been given. Hence the chief seat of stagnation was the rectum and pelvic colon, and the delay between the splenic flexure and the rectum was secondary. The distended condition of the rectum, the loss of the normal reflex desire to defæcate, and the impossibility of doing so when the attempt was made, show that the constipation was due to anæsthesia of the rectum and anal canal and atony of the muscular wall of the pelvic colon and rectum. It is probable that the trouble originated from the patient's neglect to respond to the normal defæcation reflex, to which was added later the voluntary inhibition of defæcation in order to avoid the pain caused by the passage of hard fæces over the hæmorrhoids.

It is clear that this case could not have benefited by any operation. The failure of medicinal treatment and of abdominal massage is also easy to explain, as neither of these measures could influence the only part of the intestines, which was acting abnormally. On the other hand, the fact that the enema given on July 9 completely emptied the abnormal part of the colon showed that a daily enema would be the most rational treatment. This treatment had indeed already been found to be successful, whenever it had been systematically carried out—in 1898, when the patient was under the care of Dr. Taylor, and for short periods, during which she attended Dr. Fawcett's Out-patients.



(a) July 16th 12 noon
(b) July 16th 3 p.m.
(c) July 17th 10 a.m.
(d) July 18th 10 a.m.

FIG. 26. Same case as Figs. 24 and 25, under treatment. Bowels well opened by enemata daily since July 9. Bismuth breakfast at 6 a.m. on July 16. At 10 a.m. on July 19 no shadow visible.

Accordingly every morning after July 9 an enema was given, and always with a good result. Before its administration the patient tried to defæcate without artificial aid, but never successfully.

On July 16 the patient was again given a bismuth breakfast, the daily enemata being continued during the three days occupied by the examination. The second loop of the transverse colon was already visible the morning after the breakfast (Fig. 26). But the splenic flexure, the descending and pelvic colon and the rectum were now never seen, owing to the fact that, as proved on July 9, the enemata, which were always given before the patient was skiagraphed, emptied the whole of the colon below the splenic flexure. On the third morning after the bismuth breakfast no shadow was seen, so that the removal of the mechanical obstruction, produced by the accumulation of fæces in the rectum, allowed the whole of the bismuth to be cleared out in three days, which is no longer than the period required in some normal individuals. Moreover, the abdominal pain, which was doubtless a result of the efforts of the colon to overcome the resistance offered by the fæcal masses in the rectum, disappeared with this treatment, and the patient felt in every way better.

After July 19 a drachm of magnesium sulphate with 4 minims of liquor strychninae was given three times a day in addition to the enema. A bismuth meal taken four days later showed that the medicinal treatment led to no acceleration in the passage of the bismuth through the small intestine. In ten hours, however, the greater part of the second loop of the transverse colon was visible, in addition to the ascending colon and the first loop. Apart from this, the bismuth passed along at the same rate as with enemata alone, three days being again required for its complete evacuation. Hence the aperient medicine only hastened the passage of fæces through the first part of the colon, through which they already went with sufficient rapidity. As the patient felt no better when taking the medicine in addition to enemata than when treated with enemata alone, she was given no more drugs. Soon afterwards she was allowed to leave the hospital, with strict instructions to use an enema every day.

After her return home the patient found that the enema was not always effective. A nurse was therefore sent to help her, as it seemed probable that she did not inject it properly. This proved to be the case, and after a few lessons she was able to give herself the enemata, which had now always a good result. As the injection was followed by some pain, if she walked about immediately afterwards, she was instructed to use it in the evening just before going to bed. After this she was no longer troubled with the pain, and she felt in every way better than she had done for years. Two months after the treatment was commenced the daily enema was still always effective, and the patient felt and looked very well, but she was quite unable to open her bowels without artificial aid. She then began to use the enema on alternate evenings only, but she tried to open her bowels by a voluntary effort each morning. On the morning of February 29, 1908, seven months after her discharge from the hospital, she at last succeeded, her bowels being well open without the aid of either medicine or enemata for the first time for at least ten years. For the next fourteen months she only occasionally required an enema, her bowels being well opened almost every morning, except for a few short relapses lasting about a week. In order to prevent relapses in the future the patient has been instructed to use an enema in the evening, whenever she is unable to open her bowels on any single morning.

CHAPTER II

WEAKNESS OF THE VOLUNTARY MUSCLES OF DEFÆCATION

DYSCHEZIA frequently results from insufficient activity of the voluntary muscles of defæcation, the function of which is to increase the intra-abdominal pressure, and so initiate and assist in the reflex act. The muscles concerned are (*a*) the muscles of the abdominal wall, (*b*) the muscles of the pelvic floor and (*c*) the diaphragm.

(*a*) **Weakness of the abdominal muscles. Visceroptosis.**—The majority of cases of dyschezia, in which the voluntary muscles of defæcation are at fault, are due to weakness of the abdominal muscles. This not only causes the act of defæcation to be inefficient, but, by leading to a permanent diminution in the intra-abdominal pressure, it permits the gas contained in the intestines to expand, so that the lumen of the gut increases and the activity of its musculature is impaired. The weakness of the abdominal muscles is occasionally congenital, and several members of a family may be affected in the same way. Thus Ebstein[1] refers to three brothers, who had been constipated from birth, owing to a congenitally wide separation of the recti. The abdominal muscles may become paralysed in rare instances as a result of organic nervous disease. I have seen severe constipation result in this way in Landry's paralysis (Case 11) and in a fatal case of diphtheritic neuritis.

The inefficient defæcation, which results from weak abdominal muscles, is an important factor in the constipation of people who take too little exercise owing to a sedentary occupation, laziness or obesity. It has already been explained (p. 70) how the intestines of such individuals become insufficiently active, so that their constipation is of mixed origin, the dyschezia being associated with a slow passage of fæces through the intestines. The atrophy of the abdominal muscles produced by want of exercise is often increased by their constant relaxation, owing to the assumption of a slouching position or the too frequent use of an easy chair. The atrophy and degeneration which occur in the abdominal muscles as the result of malnutrition, anæmia and prolonged fevers, such as typhoid fever, by leading to dyschezia are factors in the constipation, which, as already described, is sometimes a very troublesome sequel of such illnesses. The chief cause of the constipation, from which rachitic children sometimes suffer, is the weakness of the abdominal muscles, which results from malnutrition and from the stretching caused by excessive production of gas in the intestines. The frequent occurrence of constipation in patients with chronic disease of the heart or lungs is due mainly to the small amount of exercise they are able to take ; the abdominal muscles become weakened and dyschezia results. This is all the more likely to occur, owing to the patient being unable to make the best use of even these weakened muscles, as the straining required in defæcation increases his dyspnœa.

Weakness of the abdominal muscles most frequently arises from the stretching, which they undergo during pregnancy and which also results from ascites, from large abdominal tumours and from the accumulation of large quantities of subperitoneal and omental fat. In such cases the muscular covering of the abdomen often becomes incomplete owing to separation of the rectus muscles. Overstretching not only directly impairs the contractility of the muscles, but the increased volume of the abdominal contents necessitates a proportionately larger increase in the force required to produce a rise in the intra-abdominal pressure. After parturition or the removal of fluid or a tumour from the abdomen, the sudden diminution in the volume of the abdominal contents is so great that the stretched muscles cannot at first contract sufficiently to produce the rise in the intra-abdominal pressure necessary for efficient defæcation. If the patient remains in bed for a sufficient period, the stretched muscles gradually resume their normal tone and the separated recti come together again. If, as is so frequently the case with the poor, too little attention is paid to the condition of the abdominal muscles after parturition, and especially if pregnancy is frequently repeated, they become permanently weakened.

The weakness of the abdominal muscles brought about by these various causes is not only an extremely frequent cause of constipation, but it is also the most frequent cause of visceroptosis, with which therefore constipation is frequently associated. Ever since Glénard[2] drew attention to the condition he called ‘enteroptosis’, it has generally been held that, by producing kinks of the intestines, especially at the flexures of the colon, it gives rise to obstruction to the onward passage of fæces, so that it is really the cause of the constipation. But with the X-rays I have only rarely observed any serious delay at the splenic flexure, and never at the hepatic flexure in such cases. Moreover in a recent skiagraphic study of fifteen normal young men, Dr. C. J. Morton and I found that in the vertical position the lowest part of the transverse colon is invariably situated well below the umbilicus, even when the stomach is empty, and that the hepatic and splenic flexures are frequently quite as sharp as in any case of visceroptosis. Fig. 27 is reproduced from tracings made from a healthy man, twenty years old, whose abdominal muscles were well developed and whose bowels had always been regular; in the horizontal position the transverse colon was on a level with the umbilicus, but in the vertical position it reached four and a quarter inches lower. The splenic flexure was extremely acute, but not the slightest delay was observed in the passage of the fæces in this or any other situation. It should be noted that the acuteness of the flexures is often exaggerated by the X-rays, owing to the limb belonging to the transverse colon being situated immediately in front of that belonging to the ascending or the descending colon, so that the two limbs of the angle form a single shadow when viewed from in front.

If visceroptosis caused obstruction at the intestinal flexures, the constipation would be associated with colic. But although much discomfort is often present in such cases, colic is rare and strong contractions of the intestines are neither visible nor palpable. Moreover chronic partial obstruction due to cancer and other causes leads to hypertrophy of the intestinal musculature above the obstruction, but autopsies on cases of visceroptosis never reveal the presence of hypertrophy (Dunin [3]). Constipation in patients with visceroptosis is due in the majority of cases to the weak abdominal muscles rendering the act of defæcation inefficient, so that the rectum and pelvic colon are never properly emptied. In visceroptosis the intra-abdominal pressure is subnormal. Wenckebach[4] has shown by means of the X-rays that the weak abdominal muscles throw out of action the diaphragm, which is constantly in the inspiratory position, its movements being diminished or almost absent. If the lower part of the abdomen is supported, the diaphragm rises to its normal position and its movements are restored. When the abdominal muscles are weak, defæcation is inefficient, because it is impossible to produce the requisite rise in intra-abdominal pressure. The diaphragm is already in the position of inspiration, so that it cannot descend much further ; the abdominal muscles are so weak that their contraction produces but little effect on the intra-abdominal pressure, and the muscles of the pelvic floor are also frequently atrophied, so that they are unable to offer

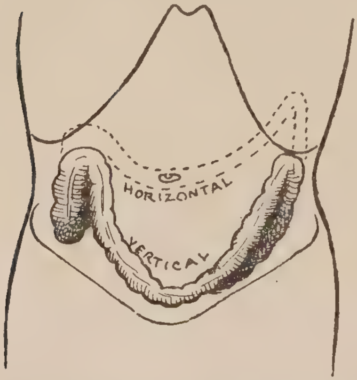


FIG. 27. Tracings of the colon in the horizontal and vertical positions in a normal individual.

any adequate resistance to the slight increase in the downward pressure, produced by the contraction of the diaphragm and abdominal muscles.

Thus neither the constipation nor the visceroptosis is the primary condition, both being due to the same cause—the weakness of the abdominal muscles. The truth of this statement can readily be demonstrated by observing the relief of the constipation and of the symptoms due to the visceroptosis by strengthening the muscles by means of exercises and massage, and by supporting them in severer cases, at any rate for a time, by means of an abdominal belt.

Case 16. *Dyschezia with visceroptosis.*—Annie C., aged 40, came to the hospital in April, 1908, for severe constipation, dating from a difficult labour two years before. The previous September she had a miscarriage, after which her constipation become worse, her bowels being only opened once every seven or ten days in spite of treatment with purgatives. Since September she has also suffered from attacks of abdominal pain and vomiting, and has had continual discomfort and a feeling of fulness in her abdomen. All her symptoms except the constipation were relieved by rest in bed.

On examination her abdomen was found to be considerably distended, and the abdominal muscles were exceedingly feeble, the recti being separated from each other by more than two inches. The right kidney was distinctly movable. On standing up, the abdomen became very prominent below the umbilicus but retracted above it, showing that a considerable degree of enteroptosis was present. Skiagraphic examination demonstrated that the colon was normal in position, so that the small intestine was the only part of the gut which dropped down in the vertical position. By pressure over the lower part of the abdomen its contents could be raised, most of the discomfort being simultaneously relieved. The latter must therefore have been due to the pull of the dropped viscera on their peritoneal attachments.

The patient was given two ounces of bismuth oxychloride in bread and milk at 3 p.m. When examined in the vertical position with the X-rays, her stomach was not much dilated, but the greater curvature reached below the level of the iliac crests. By voluntary contraction of the abdominal muscles she was only able to raise her stomach about half an inch instead of the normal four inches, though manual pressure applied below the umbilicus lifted it into the normal position.

At 11 a.m. the next morning the stomach was no longer seen; the cæcum and ascending colon contained only a trace of bismuth, but the whole of the transverse, the descending and the iliac colon were clearly visible (Fig 28 *a*).

In this case, in spite of the well-marked ptosis of the stomach, small intestine and right kidney, there was no ptosis of the colon; the hepatic flexure was actually seen to be somewhat higher than usual, and neither flexure was particularly acute. Moreover, the skiagraphic examination showed that there was no delay at either flexure, the bismuth reaching the pelvic colon well within the normal time.

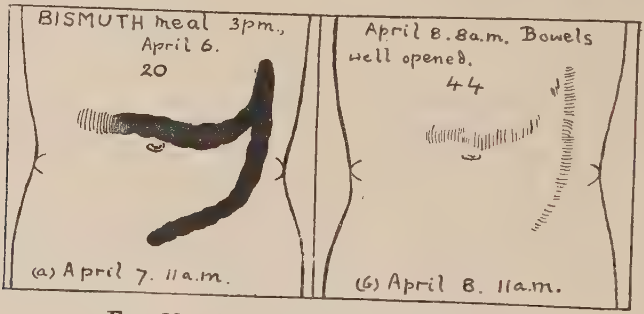

BISMUTH meal 3pm., April 6.
20
(a) April 7. 11 a.m.
April 8. 8a.m. Bowels well opened.
44
(b) April 8. 11a.m.

FIG. 28. Constipation with visceroptosis.

As the food traversed the colon at the normal rate, the constipation must have been due to inefficient defæcation, resulting from the weakness of the abdominal muscles.

The ideal treatment in this case would have been to strengthen the abdominal muscles, so as to render normal defæcation possible and at the same time to relieve the abdominal discomfort. But the fact, demonstrated by X-ray examination, that voluntary contraction of the abdominal muscles was scarcely capable of lifting the stomach at all, showed that their atrophy was probably too far advanced to make the prospect of their recovery by exercises probable, particularly as the patient was not a woman who seemed likely to persevere with the treatment. She was therefore given an abdominal belt; by preventing the drag on the peritoneal attachments of the viscera it relieved her discomfort, and it helped her to defæcate by offering a greater resistance than the weak abdominal wall to the forward movement of the viscera, caused by the descent of the diaphragm. It thus helped the latter to produce the requisite rise in the intra-abdominal pressure. She was instructed to assume a crouching position during defæcation, so as to produce a further increase in the pressure on the abdominal contents by means of her thighs.

The accumulation of fæces in the rectum and pelvic colon had led to some blunting of the defæcation reflex and distension and weakening of the last part of the large intestine. Hence even with an abdominal belt defæcation was still inefficient, until the stimulus to defæcation was artificially increased by the employment of glycerine suppositories. The second morning after the bismuth had been given, the patient being unable to defæcate, she was given a glycerine suppository at 8 a.m., with the result that a more copious evacuation was produced than had occurred for eight months. At 11 a.m., forty-four hours after the bismuth meal, she was skiagraphed, and only a small quantity of bismuth was found to be present in the transverse and descending colon (Fig. 28 *b*).

The patient was instructed to use a glycerine suppository, whenever her bowels had not acted for twenty-four hours, and to discontinue taking aperients, the sole effect of which would be to increase the activity of the small intestine and colon, which were already performing their functions quite normally. Their occasional success in mild cases of visceroptosis is probably due to their making the fæces soft; the effort required to expel the fæces is diminished and so comes within the capacity of the weak muscles of defæcation.

In spite of the undoubtedly great importance of strong abdominal muscles for the proper performance of defæcation, it is a remarkable fact that patients are occasionally met with, whose bowels act with absolute regularity, although their abdominal muscles are exceedingly weak. The following case is an extreme example of this :—

Case 17. *Congenital absence of abdominal muscles, unassociated with constipation.*—A boy of five, seen with Dr. J. H. Clatworthy and Mr. W. M. Mollison, had no trace of any abdominal muscles, as far as could be judged by palpation and electrical testing ; all the abdominal viscera were freely movable, the spleen, kidneys and liver being easily grasped by the hand. The child, however, was perfectly well, and the mother had only sought advice on account of the remarkable appearance of the abdomen. He is very active and can run about as well as other children of the same age. He has never required any artificial aid in order to keep his bowels regular. In new-born infants the act of defæcation is a simple reflex, which normally becomes weaker as the part played by the voluntary muscles of defæcation develops. In this child it must have retained almost all of its original activity, in order to compensate for the absence of development of the abdominal muscles. As, in spite of this, the boy has complete voluntary control of defæcation, the act is probably initiated and its performance assisted by the contraction of the diaphragm, which increases the intra-abdominal pressure, as, owing to the tension of its connective tissue and skin, the abdominal wall does not bulge forward sufficiently far to annihilate the effect on the intra-abdominal pressure produced by the descent of the diaphragm.

(*b*) **Weakness of the muscles of the pelvic floor.**—The part played by the levator ani muscles in the act of defæcation has already been referred to in the description of the physiology of the process. A number of authors have described how injury to these muscles during parturition may be an important factor in the constipation of women who have borne many children. In England the subject has been somewhat neglected, although Lauder Brunton[5] has on various occasions directed attention to it, and in recent years the researches of anatomists and gynæcologists, amongst whom special mention should be made of Paramore,[6] on the structure and functions of the pelvic floor have indirectly thrown light on the question. But the fullest investigation of the constipation, which results from injury to the pelvic floor, is the work of Ludwig Pincus of Danzig, who has collected his results in a small book published in 1908.[7] In twenty years of gynæcological practice he has seen 723 cases of this kind, 89 of whom consulted him on account of the constipation only.

The pelvic floor consists of a muscular diaphragm, which is formed by the levator ani together with other less important muscles, and is strengthened above and below by a layer of fascia. Pincus found, by observations made during numerous operations and in a few autopsies, that the harm done by parturition consists less in any actual tearing than in a general atrophy of the levator ani muscles. They are fragile, pale and relaxed, in marked contrast to the other muscles of the body, which were examined at the same time for comparison. The change is generally unilateral and is due probably to overstretching and to ischæmia from the long-continued pressure of the fœtal head during difficult labour. Ischæmia in the muscles of other parts of the body leads to their shortening ; the injured muscles of the pelvic floor are, however, permanently subjected through the agency of the viscera to the positive intra-abdominal pressure, so that they are always being stretched, with the result that relaxation instead of contraction occurs. This is especially likely to be the case in the poorer classes, who, being unable to obtain sufficient rest after parturition, cannot avoid the continuous increase in the pressure on the pelvic floor produced by the assumption of the upright position and the frequent further strains produced by active movements. The well-to-do, on the other hand, though equally liable to injury of the pelvic floor, are able to remain recumbent for a longer period, during which the pelvic floor is only subjected to a minimal downward thrust, and has therefore time to recover.

The anal sphincters may also be injured in parturition, either simultaneously with or independently of the levator ani muscles. But the injury is of comparatively small importance, as they only take an insignificant part in defæcation and they do not under normal conditions help to retain the fæces, which are stored in the pelvic colon and not in the rectum. If, however, the injury occurs in a patient suffering from dyschezia, incontinence of fæces would result, were it not for the fact that the levator ani muscles, as Pincus has shown, can, when required, perform the functions of the sphincters. But when injury to the levator ani muscles is associated with injury to the anal sphincters, then the dyschezia resulting from the former is accompanied by incontinence of fæces resulting from the latter.

As the chief cause of weakness of the levator ani muscles is parturition, and as this is also frequently followed by weakness of the abdominal muscles, the dyschezia in women, who have borne many children, is very often due to weakness of the muscles of both the abdominal wall and the pelvic diaphragm. In all cases, therefore, in which a woman, whose bowels have previously been regular, becomes severely constipated after the birth of a child, the condition of the pelvic floor should be investigated as well as that of the abdominal wall. The anus is normally slightly retracted ; the retraction is increased and the anus moves slightly forward when the levator ani muscles are contracted. If they are weak the retraction in the condition of rest is absent or less than normal, and on contracting the levator ani muscles the retraction and forward movement are slight or absent. With a view to testing the condition of the levator ani muscles, a patient may be told to make the same sort of effort she would make, if she wished to overcome an urgent desire to defæcate. If the levator ani muscles are weak, on straining or making a bearing-down effort the whole perineum projects much further than it should do, even if no actual prolapse is produced.

In severer cases of injury to the pelvic floor the uterus may be more or less prolapsed ; in such cases no further evidence is required to show that the dyschezia, which is always present, is partly, at any rate, due to the weakness of the levator ani muscles.

If after making these simple observations there is still some doubt as to the condition of the levator ani muscles, Pincus recommends that they should be directly palpated from the rectum, the patient being told to make an effort which causes them to contract. If the muscles have been injured, the contraction is found to be weak, particularly on one side, or abnormally wide gaps may be felt between the muscle-bundles.

Although parturition is the cause of all the severe cases of dyschezia resulting from weakness of the levator ani muscles, a mild form of the latter condition is frequently associated with the weak abdominal muscles of individuals who lead a sedentary life, and it no doubt is a factor in the production of the constipation from which they suffer.

(*c*) **Impairment of the action of the diaphragm.**—Our X-ray observations have shown how important the contraction of the diaphragm is in defæcation. The diaphragm is permanently depressed in emphysema and temporarily during an attack of asthma. Hence no great rise in the intra-abdominal pressure can be produced in either condition by contracting the diaphragm. This is of comparatively small importance in the case of uncomplicated asthma, as the attack generally ceases in the morning, but in emphysema it often causes considerable difficulty in defæcation, with the result that constipation is produced. The constipation, which often occurs during an attack of pneumonia or pleurisy, is due to a variety of causes already mentioned in the discussion of the constipation of fevers (*vide* p. 55), but the temporary paralysis of one or both halves of the diaphragm, which occurs in these conditions, is an important additional factor.

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[1] W. Ebstein: *Die chronische Stuhlverstopfung*, p. 18. Stuttgart, 1901.

[2] F. Glénard: *Les Ptoses Viscérales.* Paris, 1899.

[3] T. Dunin: *Berl. Klinik*, Heft 34, 15, 1891.

[4] Quoted by A. Keith: *Visceroptosis*, in Allbutt and Rolleston's *System of Medicine*, iii, 874, second edition, 1907.

[5] Sir Lauder Brunton: *On Diseases of Assimilation, Digestion, &c.*, p. 432. London, 1901; *Constipation*, in Allbutt and Rolleston's *System of Medicine*, iii, 635, second edition, 1907.

[6] R. H. Paramore: *Proc. Royal Soc. Med.*, June, 1908, and *Journ. of Obst. and Gyn.*, xiv, 173, 1908.

[7] L. Pincus: *Constipatio muscularis s. traumatica mulieris chronica* (Volkmann's *Sammlung klin. Vortr.*, 474, 475), 1908.

CHAPTER III

UNFAVOURABLE POSTURE IN DEFÆCATION

THE high seat of the ordinary modern water-closet is often an important factor in the production of dyschezia. The natural position for defæcation, which is assumed by primitive races, is the squatting position. The great rise in intra-abdominal pressure, produced on squatting by the forcible apposition of the thighs to the abdomen, is to a great extent lost when a high seat is used.

In healthy people defæcation is efficiently performed even when a high seat is used. But in individuals, in whom defæcation is already difficult owing to weakness of the abdominal muscles or other cause, the position which has to be assumed owing to the common construction of modern water-closets, deprives them of an important means of compensating for the deficiency.

CHAPTER IV

WEAKNESS OF THE DEFÆCATION REFLEX

In very young infants, in whom the act of defæcation is a pure reflex, unassisted by any voluntary effort, constipation sometimes results from insufficient excitability of the structures concerned in the reflex, so that the natural stimulus to defæcate is too weak to produce an adequate response. Defæcation then occurs only after a large quantity of fæces has accumulated in the rectum. In such cases defæcation at once follows if the natural stimulus is exaggerated by the mechanical effect of the introduction of a finger into the rectum, or by the combined mechanical and chemical effect of the introduction of a piece of soap or a glycerine suppository.

Constipation, due to too little food or food containing insufficient mechanical excitants of intestinal activity, is liable to be complicated by dyschezia. When, after an abnormally long period, the fæces reach the pelvic colon, their bulk is so small that it requires the accumulation of two or three days to produce a sufficient stimulus for efficient defæcation. The form of constipation, which results from a too complete absorption of the food owing to a ‘greedy colon’, is probably due more to insufficient stimulation of defæcation than to insufficient stimulation of the intestinal movements, as in the only well-marked case of the kind I have examined with the X-rays (Case 5) there was no delay in the passage of food through the intestines.

The production of dyschezia by organic diseases of the central nervous system, which involve the lower end of the spinal cord or the tracts connecting it with the brain, has already been discussed in the description of the physiology of the nervous control of defæcation (p. 34); it is generally associated with some disturbance in micturition. In tabes slight constipation is often present, owing to deficiency in the normal afferent impulses from the rectum which produce the desire to defæcate, so that the fæces tend to accumulate in large quantities before they produce a sufficiently strong impulse to cause reflex defæcation.

Case 18. *Dyschezia appearing as the first symptom of tabes dorsalis.*—A man of thirty-five was recently sent to me on account of severe constipation, which had gradually developed during the two previous months. I found that he was suffering from dyschezia, and the fæces impacted in his pelvic colon had given rise to a good deal of colic. His tendo-Achillis-jerks and knee-jerks were absent and his pupils reacted sluggishly to light. His gait was slightly ataxic and Romberg's sign was present. It was thus clear that the dyschezia was due to tabes dorsalis, although the patient had hitherto noticed no other symptoms. The fæcal accumulation was removed by enemata and ♏ v of liquor strychninæ were given three times a day. With this treatment the patient lost his colic and regained to a great extent his power to defæcate, but he still requires an occasional enema.

Diseases of the brain are less frequently associated with dyschezia than diseases of the spinal cord, as they are less frequently bilateral, and both cerebral hemispheres are probably capable of controlling the act.

CHAPTER V

HYSTERICAL DYSCHEZIA

Babinski[1] has defined hysteria as a pathological mental condition in which the patient is abnormally suggestible, so that disorders in the various functions of the body, especially those of movement and sensation, can be produced by suggestion by the patient himself (auto-suggestion) or by other people. Thus in a patient with this pathological mental condition a slight injury to a finger may lead by auto-suggestion to paralysis of the whole arm, and it is easy for an observer to produce anæsthesia in any part of the body by suggestion. In the same way an hysterical patient may suggest to himself that he cannot pass urine or open his bowels and retention of urine or dyschezia results. Relatives or the medical attendant may by too minute inquiries as to the condition of the bowels also suggest to the patient that there is something wrong with them, with the result that he becomes unable to defæcate.

In a milder and more frequent form of this condition, the patient persuades himself that he is quite unable to defæcate unless he takes a purgative or an enema, although in reality no such artificial help is required. Oppenheim[2] describes the case of an hysterical woman, who could only open her bowels when she gave one of her children castor oil, although this drug, as well as all other purgatives, was without effect when she took it herself.

The dyschezia produced by suggestion is a genuine thing, just as hysterical paralysis or anæsthesia is, the patient being quite unable to open his bowels however much he tries. But the dyschezia, like the paralysis and anæsthesia, is always curable by suggestion or persuasion alone. If such a patient can be persuaded after a thorough examination that there is really no reason whatever why he should not obtain a daily action of his bowels, he will have no difficulty in curing himself at once.

Hysterical constipation may be associated with any of the other symptoms, which suggestion can produce. Sometimes, however, it occurs in hysterical people, who happen at the time to be otherwise well. In such cases a history of hysterical symptoms in the past and the mental condition of the patient, together with the complete absence of any discoverable cause of constipation, are sufficient to lead to a correct diagnosis, which is readily confirmed by the immediate success of treatment by persuasion and suggestion without the aid of drugs or other therapeutic measures.

Case 19. *Hysterical dyschezia.*—A neurotic girl of 18 was admitted into Guy's Hospital for constipation and abdominal pain. Her bowels had been irregular for the last three months, and when admitted she had passed nothing for four days. Her rectum was found to be packed with fæces, in spite of which she experienced no desire to defæcate. Her abdominal muscles were strong and there appeared to be no reason why she could not empty her rectum. She was therefore told that her bowels would certainly act if she made an effort, which she had not done for four days, because she had persuaded herself that she was so constipated that it would be useless to try. On making an effort, she succeeded in passing a large quantity of fæces. She was encouraged to try to open her bowels each morning, and she did not again experience any difficulty in doing so.

Some French authors have regarded the constipation of hysterical patients as a result of loss of the defæcation reflex owing to anæsthesia of the rectal mucous membrane, which they have discovered to be frequently associated with anæsthesia of the pharyngeal mucous membrane. But the investigations of Babinski have shown that the latter condition is never present as a primary symptom in hysteria, but is invariably a result of suggestion on the part of the observer. My own observations on a considerable number of hysterical patients have led me to accept Babinski's conclusions without reserve. There can be no doubt that the rectal anæsthesia discovered by the French authors was also a result of suggestion on their part; it is, moreover, highly probable that the hysterical dyschezia was aggravated by the examination.

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[1] J. Babinski: *Démembrement de l'Hystérie traditionnelle.* Paris, 1909.

[2] H. Oppenheim: *Lehrbuch der Nervenkrankheiten,* ii, 1264, fifth edition. Berlin, 1908.

SECTION B

OBSTACLES TO EFFICIENT DEFÆCATION

Efficient defæcation may be prevented by (1) abnormally hard and bulky fæces, (2) functional or organic stricture of the rectum or anal canal, (3) rectoceles and (4) invagination.

CHAPTER I

HARD AND BULKY FÆCES

In an earlier chapter (p. 92) it was shown how hard and bulky fæces pass with abnormal slowness through the distal part of the colon. The force required to evacuate them from the rectum may also be so great that a condition of dyschezia results in addition to the simple constipation. Robson [1] recently described six cases of this sort as examples of 'acute fæcal impaction in the rectum'; the dryness of the fæces, which had to be broken up by the finger before removal from the rectum was possible, was due in each case to recent excessive loss of fluid from diarrhœa or hæmorrhage. The difficulty in expelling the fæces from the rectum was probably associated with delay in the passage through the intestines.

Occasionally a movable mass of fæces collects in the rectum, where it causes difficulty in defæcation by forming a sort of ball-valve, which produces an obstruction when the patient strains, but at other times allows thin fæces to pass, especially if the patient lies down during defæcation. This condition was first described by Simpson [2] and is well illustrated by Case 26 and the following case, recorded by Curling [3]:—

A lady, 50 years old, had for eighteen months been unable to relieve her bowels without aperients and the introduction of a finger into her rectum. A hard elongated mass of fæces was found in the rectum; this was evidently forced down to the commencement of the anal canal, which it obstructed, whenever an attempt was made to defæcate, but the introduction of a finger pushed it back, so that fluid fæces could escape at its side. The mass was broken up by the handle of a spoon and the bowels were then emptied by enemata. The patient was cured.

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[1] W. M. Robson: *Brit. Med. Journ.*, 1908, i, 1041.

[2] Simpson: *Edin. Monthly Journ. of Med. Sc.*, ix, 705, 1849.

[3] T. B. Curling: *Diseases of the Rectum*, p. 187, fourth edition. London, 1876.

CHAPTER II

FUNCTIONAL AND ORGANIC STRICTURE OF THE RECTUM AND ANAL CANAL

THE act of defæcation may be rendered difficult or impossible by (*a*) spasm of the anal sphincters, (*b*) organic stricture of the rectum or anus, (*c*) kinking at the pelvirectal flexure and (*d*) pressure on the rectum from without.

(*a*) **Spasm of the sphincter ani.**—Spasm of the sphincter ani may occur in nervous individuals, in whom it is generally associated with spasm of other parts of the colon. More frequently it is produced reflexly by an anal ulcer, inflamed hæmorrhoids, gonorrhœal proctitis or disease of the genito-urinary organs; it may perhaps also result from the presence of threadworms in the rectum. When of long standing, the spasm leads to hypertrophy of the sphincter ani. The resistance offered by the contracted and hypertrophied sphincters increases the effort required to evacuate the rectum. The dyschezia is rendered worse by the frequency with which defæcation is voluntarily postponed on account of the pain it causes. Thus hæmorrhoids and anal ulcers aggravate the constipation, which is generally the chief factor in their production.

The accumulation of hard fæces in the rectum in dyschezia may also give rise reflexly to anal spasm. The difficulty in expelling the hard fæces, which is already present owing to the weakness of the voluntary or involuntary muscles of defæcation, is increased by the abnormal resistance offered by the contracted sphincters. Cleveland[1] found in ten cases of this sort that forcible stretching of the sphincters improved the condition by diminishing the resistance to defæcation; if the primary cause of the dyschezia was at the same time treated and distension of the rectum was prevented by means of enemata, the muscles of defæcation often recovered by the time that the normal tone returned to the stretched sphincters.

(*b*) **Organic stricture of the rectum and anus.**—In all cases of dyschezia it is important to examine carefully for the possible presence of organic stricture of the rectum or anus.

(1) *Congenital narrowness of the anal canal* is a rare cause of dyschezia, signs of which may be present from birth, but more frequently the constipation only becomes obvious after some months or years, when the fæces become harder. It may lead to an enormous accumulation of fæces in the pelvic colon, as in the case of a boy of eleven, in whom a fæcal tumour, the size of a full-term fœtus, had formed (Grey [2]). Such cases can be cured after evacuation of the fæces by forcible dilatation of the anus and the subsequent passage of a bougie at regular intervals for several months.

(2) *Hyperplasia of Houston's valves.*—It has been suggested that pathological changes in Houston's valves may lead to constipation. The valves consist of semilunar folds of mucous membrane, which project into the rectum and correspond with depressions on its exterior (Fig. 8). In the majority of cases there are three, the uppermost of which is situated on the left side at the junction of the pelvic colon with the rectum; the lowest is also on the left side, about two inches from the anus; the third, which is generally the largest, is on the right and is rather nearer the lowest than the uppermost valve.

Most writers have followed Houston [3] in believing that the function of the valves is to support the weight of the fæces, although O'Beirne [4] as long ago as 1833 showed the error of this view by demonstrating that the fæces are normally retained in the pelvic colon and merely pass through the rectum during the act of defæcation.

According to Martin,[5] Pennington [6] and a number of other American authors, constipation is frequently caused by hyperplasia of Houston's valves. The hyperplasia may be congenital, but is more often the result of inflammation, which is particularly liable to occur if the valves are unusually large or are irregular in arrangement.

The symptoms, which Pennington ascribes to this condition, are simply those of dyschezia. He claims to have relieved them by removing part of the valves by means, which will be described later.

It is, however, exceedingly doubtful whether dyschezia is ever really due to abnormalities in Houston's valves. They are only prominent when the rectum is distended; they are therefore particularly easy to feel in patients with all varieties of dyschezia. The continual irritation of the mucous membrane of the 'valves' by the retained fæces often leads to chronic inflammatory changes in them. The condition described by Pennington is thus often a sequel of dyschezia, and evidence is still wanting to show that it is ever its cause. In the normal undistended condition of the rectum the folds are either not palpable at all or they form slight unresisting projections, which could not possibly cause any obstruction to defæcation. Tuttle[7] states that the valves were very well developed in many of the hundreds of cases, which he has examined with a proctoscope, but he never saw anything more than a small particle of fæces arrested above any one of them, and in many cases, in which the bowels were perfectly regular, the valves were just as well developed as in patients with severe constipation.

(3) *Fibrous stricture.*—A fibrous stricture of the rectum is an occasional sequel of operations on hæmorrhoids. It may also result from syphilis and, especially in women, from gonorrhœa.

(4) *Cancer.*—Cancer of the rectum and pelvic colon is a common and most important cause of constipation. In a series of 481 cases of intestinal cancer, the growth was situated in the pelvic colon in 22 per cent. and in the rectum in 58 per cent. (Barnard). When constipation develops after the age of forty without any obvious cause, especially if it is accompanied by a sense of fulness in the rectum and of incomplete relief after defæcation, by loss of weight and strength, or by discharge of mucus and blood, the possibility of cancer of the rectum should always be considered, and a thorough rectal examination made by the finger and, if necessary, by a proctoscope or sigmoidoscope. A digital examination is sufficient for the diagnosis of rather more than half of the cases. Thus in a hundred cases examined by Gant, five were situated at the anal margin, ten in the anal canal and fifty in the rectal ampulla; the

remaining thirty-five, twenty of which were in the upper part of the rectum and fifteen at the pelvi-rectal flexure or in the pelvic colon, could only have been diagnosed with certainty with the aid of the sigmoidoscope.

(*c*) **Obstruction at the pelvi-rectal flexure.**—A group of cases has already been mentioned, in which dyschezia results from inability to pass the contents of the pelvic colon into the rectum, the evacuation from the rectum, when it is once filled, offering no special difficulty. This condition was first recognized by O'Beirne,[4] who regarded it as a common cause of constipation. He believed that, if the normal accumulation of fæces in the pelvic colon is not evacuated at the proper time owing to the 'pernicious habit of disobeying natural calls to stool', spasm of the circular muscle-fibres at the pelvi-rectal flexure occurs. Moreover the weight of the accumulation of hard fæces in the pelvic colon may now be so great that the pelvic colon can no longer rise into the abdomen, and the pelvi-rectal angle is permanently so acute that considerable obstruction to the passage of fæces occurs. This is further increased by the direct pressure exerted on the rectum by the fæces in the pelvic colon (Fig. 29). The latter can be felt projecting into the front of the rectum, and occasionally it can be pushed up out of the pelvis.

The prolonged retention of hard fæces in the pelvic colon may lead to chronic inflammatory changes in the mucous membrane and in the surrounding peritoneum. Adhesions may then occur, which fix the pelvic colon to the rectum or to the floor of the pelvis. Normally inflation causes the pelvic colon to rise, so that a sigmoidoscope can be easily introduced into it, but in cases of this sort, in which the pelvic colon is bound down by adhesions, Tuttle[7] found that it is difficult or impossible to pass the instrument beyond the rectum.

Case 20. *Dyschezia due to spasmodic obstruction at the pelvi-rectal flexure.*—In a case of obstruction at the pelvi-rectal flexure, which I had the opportunity of examining with the X-rays, the fæces reached the pelvic colon without delay. In spite of this the bowels were never opened without the help of enemata. The rectum was almost empty, even after the bowels had not been open for several days, but fæces were felt in the pelvic colon through the front wall of the rectum. Nothing abnormal was seen with the sigmoidoscope, and the obstruction at the pelvi-rectal flexure was insufficient to prevent the passage of the instrument, so that it was probably spasmodic in origin and not due to a kink produced by adhesions. By means of enemata the accumulation of fæces could always be removed from the pelvic colon, and after a time normal defæcation returned.

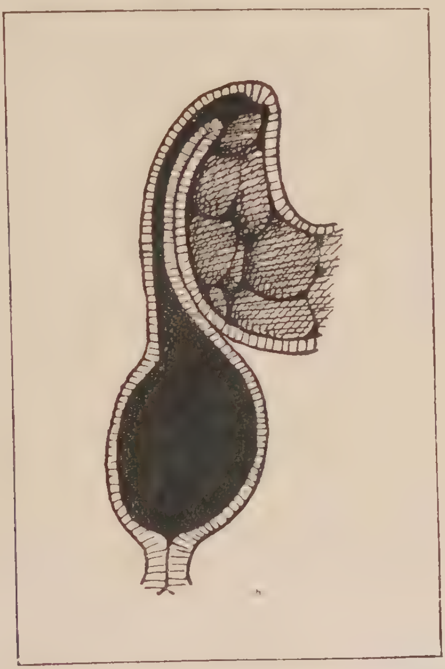

Fig. 29. Diagram to illustrate obstruction at the pelvi-rectal flexure.

(*d*) **Pressure on the rectum from without.**—Retroversion of a normal uterus cannot cause any obstruction to the passage of ordinary fæces, as it is too small and too movable, but it may increase the difficulty in expelling unusually large and hard accumulations. Pressure on the pelvic colon and rectum by a gravid uterus always produces some dyschezia. Even when the bowels have been opened regularly every day throughout the period of pregnancy, the large amount and the character of the evacuations after a natural delivery show, as Matthews Duncan[8] pointed out, that during the later months retention of fæces occurs. The obstruction produced by a retroverted gravid uterus is much greater than that produced by one in the normal position, but urgent symptoms of retention of urine generally occur before the dyschezia becomes troublesome.

Other pelvic tumours, such as cancer and fibroids of the uterus and ovarian tumours, may give rise to dyschezia by compressing the pelvic colon and rectum. In men, obstruction is rarely produced by pressure from without, as tumours of the prostate generally demand surgical interference for urinary symptoms before they are of sufficient size to press upon the rectum. In rare cases an ankylosed and deformed coccyx may cause obstruction (p. 53).

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[1] C. Cleveland: *New York Med. Record*, xxxv, 261, 1889.

[2] H. Grey: *Brit. Med. Journ.*, 1905, i, 353.

[3] J. Houston: *Dublin Hosp. Reps.*, v, 158, 1830.

[4] J. O'Beirne: *New Views of the Process of Defecation.* Dublin, 1833.

[5] T. C. Martin: *Obstipation* (quoted by J. P. Tuttle: *Diseases of the Anus, Rectum and Pelvic Colon*, p. 533. London, 1903).

[6] J. R. Pennington: *Journ. Amer. Med. Ass.*, xxxv, 1520, 1900.

[7] J. P. Tuttle: *Diseases of the Anus, Rectum and Pelvic Colon*, pp. 522 and 537. London, 1903.

[8] J. Matthews Duncan: *Med. Times and Gaz.*, 1879, ii, 522.

CHAPTER III

RECTOCELE

GANT has observed two cases in which constipation was due to a *posterior rectocele*, which resulted from insufficient support for the rectum, owing to *congenital absence of the coccyx*. When the recto-vaginal septum is weak, an *anterior rectocele* may form, the fæces being forced into a pouch projecting into the vagina instead of into the anal canal: in such cases an operation often relieves the dyschezia by restoring the septum, so that the force exerted in defæcation is no longer wasted in driving the fæces towards the vagina, but acts in the proper direction.

CHAPTER IV

INVAGINATION

Harrison Cripps[1] has described a condition, in which invagination of the mucous membrane of the upper part of the rectum into the lower part produces obstruction to the passage of fæces, which is aggravated by straining, as the size of the invagination is thereby increased. It may give rise to catarrhal proctitis, mucus and occasionally a little bright red blood being passed. On digital examination the invaginated mucous membrane can be felt, especially when the patient strains, and after defæcation the patient feels as if something was still present in the rectum. At a later stage the invagination may reach the anus and produce an obvious prolapse.

According to Gant,[2] chronic intussusception of the muscular and serous coats in addition to the mucous membrane of the pelvic colon into the upper part of the rectum is a not uncommon cause of constipation in adults, especially of the female sex. He believes that an intussusception of the pelvic colon into the rectum occurs normally during defæcation, the fæces being driven downwards as if by the piston of a syringe. When the mesentery of the pelvic colon is abnormally long and the quantity of fæces it contains is abnormally large, or when for any reason frequent straining occurs, this intussusception is increased, and instead of helping defæcation, it impedes the passage of fæces, but insufficiently to produce complete obstruction owing to the wide lumen of the rectal ampulla. In the slighter cases the intussusception recedes after defæcation; in others the pelvic colon remains invaginated into the rectum for considerable periods or even permanently. The condition can be diagnosed by digital examination of the rectum and by the sigmoidoscope; if the latter is slowly withdrawn, the gut can be seen to prolapse and to follow it down to or even through the anus. At other times, if the patient is in the knee-elbow position, it can be seen to recede. Tuttle[3] has treated fifteen and Gant over fifty cases of this sort by 'sigmoidopexy', the pelvic colon being fixed to the anterior abdominal wall at one or more points so as to prevent it from again entering the rectum. Only one death occurred in Gant's series of cases and good results were obtained in all the others; treatment by massage, electricity and an abdominal belt was, however, generally necessary in addition.

I am, however, inclined to think that the frequency of this condition must be very much less than Gant believes, as it could otherwise have scarcely escaped the observation of almost all previous writers on diseases of the rectum. It seems more probable that the majority of Gant's cases were really of the same nature as those of Cripps, and that the protruding mass felt with the finger and seen with the sigmoidoscope was an invagination of mucous membrane alone, and that no true intussusception, consisting of all the coats of the intestine, was present. According to Tuttle, true intussusception of the pelvic colon into the rectum is almost always preceded by chronic constipation, due to a growth or stricture; this gives rise to an accumulation of fæces in the pelvic colon, which sags down into the rectum.

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[1] W. H. Cripps: *Diseases of the Rectum and Anus*, p. 124, second edition. London, 1890.

[2] S. G. Gant: *Constipation and Intestinal Obstruction*, pp. 107 and 460. Philadelphia, 1909.

[3] J. P. Tuttle: *Diseases of the Anus, Rectum and Pelvic Colon*, p. 677. London, 1903.

PART III

SYMPTOMS

INTRODUCTION

> ‘Les personnes qui ont . . . le mouvement péristaltique aisé et régulier, qui s’acquittent tous les matins, dès qu’ils ont déjeuné, d’une bonne selle, aussi aisément qu’on crache ; ces personnes favorites de la nature sont douces, affables, gracieuses, prévenantes, compatissantes, officieuses. Un “non” dans leur bouche a plus de grâce qu’un “oui” dans la bouche d’un constipé.’ (MOLIÈRE.)

In his *Observations on Purgative Medicines*, published in 1805, James Hamilton gave a remarkable list of diseases, which he believed were caused by constipation. Few writers on the subject since Hamilton’s time have failed to add to his list, so that there are now scarcely any diseases, which have not at one time been supposed to result from constipation. Ebstein[1] and Lane[2] are the most prominent of the recent authors, who regard constipation as an extremely potent cause of all manner of pathological conditions ; Lane indeed states his belief that the harm done by constipation is ‘infinitely greater and more far reaching than that ascribed to alcohol’. If the results of constipation given by him be added to those given by Ebstein, we obtain an array of diseases varying from angina pectoris and stammering to cancer of the breast and a ‘graveyard smell of the flesh’. This can well be compared with the extraordinary lists of symptoms which were ascribed by Hack and his followers to tumefaction of the nasal mucous membrane, by Bouchard to auto-intoxication from a dilated stomach, and by Haig to uric acid poisoning. If all the authorities were to be believed, we should have to treat, for example, such conditions as neurasthenia and chlorosis by cauterizing the nasal mucous membrane, by washing out the stomach, by a diet of bread, milk, cheese, dried fruits and nuts, and by oil-enemata or colectomy. For we are given no criteria, by means of which the particular cases curable by any one of these methods can be recognized, an abnormal nasal mucous membrane, a dilated stomach, uric acid poisoning and constipation being often diagnosed by their respective advocates on quite insufficient grounds, whenever any of their supposed results are present, so that they are regarded as of a frequency far beyond that which an unbiased observer would admit.

It cannot be denied that a vast number of pathological conditions may be associated with constipation. But it is a very different thing to regard constipation as the cause of them all. Constipation is of such common occurrence that in many cases the association is purely accidental. Often the constipation and the associated symptoms are both produced by a common underlying pathological process, the cure of which will result in the relief of the constipation as well as of the associated symptoms. Thus the constipation which is frequently present in typhoid fever has clearly no direct connexion with the rash or other symptoms of that disease, being, like them, simply one of the manifestations of the infection. Similarly, the constipation associated with chlorosis and neurasthenia is secondary to these conditions, the other symptoms present being due, like the constipation, to the chlorosis and neurasthenia respectively. Many writers, however, have failed to distinguish between a concurrence of phenomena and a sequence of phenomena, so that they have been led to regard the constipation as the cause of these conditions. But the cure of the chlorosis or neurasthenia results in the disappearance of the constipation, whereas the cure of the constipation, though it often produces some improvement, does not cure either the chlorosis or neurasthenia. The improvement is due to the fact that constipation, which is a common symptom of chlorosis and neurasthenia, has a bad effect upon them as a result of auto-intoxication and reflex action. Though the symptoms of neurasthenia and chlorosis may be aggravated by the associated constipation, they should no more be regarded as symptoms of constipation than the rose-spots in those cases of typhoid fever, in which constipation is present.

There can, however, be no doubt that constipation may itself be the direct cause of a considerable variety of symptoms. But different individuals react very differently to constipation, as is well shown by the two following cases:

Case 21. *Constipation with manifold symptoms.*—A woman, aged 36, was admitted into Guy's Hospital for constipation; her bowels had not been opened for three weeks. She complained of a severe headache, buzzing in the ears, blurred vision, extreme depression with loss of memory, drowsiness and great physical weakness. She constantly wished to empty her bladder, but micturition was difficult and painful. Her complexion was muddy and her abdomen swollen and tender. Her rectum was found to be tightly packed with fæces, which were removed by enemata. Treatment with enemata was followed by the rapid disappearance of all the symptoms, and at the end of a week she was once more able to defæcate without mechanical help.

Enormous accumulation of fæces with no symptoms until shortly before death.—A French army surgeon had been constipated from birth. In spite of having a very good appetite, his bowels were seldom opened more than once in two months, and at the age of 42 the frequency had diminished to three or four times a year. When his bowels were opened huge quantities of fæces were passed, and on one occasion the pips of raisins taken twelve months before were recognized in the stool. His abdomen was greatly distended. In spite of the fact that he had seldom passed more than four or five stools a year, the patient never complained of any symptoms, until, at the age of 54, he had an attack of abdominal pain and vomiting, from which he died. At the autopsy the rectum was found to be enormously distended and its mucous membrane ulcerated; the rest of the colon was moderately enlarged, the whole intestine containing sixty pounds of fæces. An inch above the anus a fibrous septum was found, which had resulted in partial obstruction (Renauldin[3]).

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[1] W. Ebstein: *Die chronische Stuhlverstopfung.* Stuttgart, 1901.

[2] W. Arbuthnot Lane: *Operative Treatment of Chronic Constipation.* London, 1904. Also *Lancet*, 1905, ii, 1695; *Brit. Med. Journ.*, 1905, i, 700; 1908, i, 126; and 1909, i, 1408.

[3] Renauldin in the *Dict. des Sciences Médic.*, vi, 257, 1813.

SECTION A

CAUSE OF THE SYMPTOMS

It is still uncertain in what manner many of the symptoms of constipation are produced. At present the most popular theory is that of intestinal auto-intoxication. There is, however, no doubt that some symptoms are purely reflex in origin, and others are simply due to the mechanical pressure exerted on various structures by fæcal accumulations. Before describing the symptoms in detail, the evidence as to the relative importance of these factors must be discussed.

CHAPTER I

AUTO-INTOXICATION. COPRÆMIA

The slow passage of fæces through the alimentary canal has been supposed by many to result in an abnormally large production of poisons; these are supposed to produce on absorption the symptoms of constipation, which depend therefore on auto-intoxication from the alimentary canal or 'copræmia', a word which appears to have been invented by Robert Barnes.[1] The idea of intestinal auto-intoxication was not, however, new. Albert von Haller,[2] writing in 1765, expressed his belief that in constipation foul water was absorbed from the fæces and, 'filling the blood with rancid parts, produced fever, hæmorrhages, consumption and insanity.' But the theory received its most important development in the hands of Bouchard,[3] who believed, however, that auto-intoxication was much more frequently produced by a dilated stomach than by constipation.

There are no entirely satisfactory methods of estimating the activity of bacterial decomposition in the intestines. Jaffé[4] thought that it could be measured by the amount of indican, and Baumann[5] by the amount of ethereal sulphates present in the urine. The results obtained, however, give no definite indication as to the degree of auto-intoxication which may be present, as different putrefactive bacteria produce different products, some of which are comparatively innocuous, whilst others are excessively poisonous. Hence an increase in the quantity of indican or ethereal sulphates in the urine is no evidence that excessive production of other more poisonous products is occurring, and, on the other hand, it would be quite possible for severe intestinal auto-intoxication to occur in the complete absence of any change in the urine, which could be demonstrated by Jaffé's or Baumann's methods. Both indican and ethereal sulphates have been found to be increased in some cases of constipation, but by no means constantly, as Jaffé found indicanuria only rarely in constipation, and Strauss and Philippson [6] found a diminution in the ethereal sulphates as often as an increase. Moreover, when excess of these substances is present in the urine of constipated individuals, it may just as well be due to the increase in the quantity absorbed, owing to the longer stay of the fæces in the colon, as to an increase in the quantity produced. Thus Ury [7] found that the quantity of volatile fatty acids, indol, phenol and aromatic oxy-acids in the fæces was diminished after they had been retained in the rectum by a voluntary effort for three days. The only way to avoid this error would be to estimate simultaneously the products of intestinal putrefaction in the fæces and in the urine, but up to now this has only been done in a single case of constipation with inconclusive results (Baumstark [8]). There is thus at present no chemical evidence that an abnormal amount of decomposition occurs in the intestines of constipated people. There is, on the contrary, reason to believe that in many cases of constipation bacterial activity in the intestines is actually diminished, as Strasburger [9] found that the total number of dead and living bacteria in the fæces is smaller than under normal conditions.

It is, however, possible that even in the absence of any increase in the production of poisons, the slow passage of fæces through the intestines might lead to auto-intoxication by giving more time for the absorption of products of bacterial decomposition. But definite evidence is still wanting to show that the products of ordinary bacterial decomposition in the intestines can give rise to poisonous symptoms on absorption. The substances which are excreted in the urine as ethereal sulphates are not very poisonous, as they are sometimes present in large quantities in the absence of any general symptoms. Sulphuretted hydrogen, which is normally only present in traces in the colon, was formerly supposed to be one of the active poisons in constipation, but, according to Ewald,[10] the quantity present in the colon is either not at all or only very slightly increased in constipation, and I have never observed any excess of bismuth sulphide in the stools of constipated patients after the oxychloride had been administered. Moreover, large quantities of the gas were injected into the rectum as treatment for tuberculosis by Bergeon and others in 1886 without, as a rule, producing any injurious effects. Absorption of excess of ammonia and simple amido-acids would produce no serious results, as they are converted by the liver into non-poisonous urea. Herter[11] ascribed the headache, lassitude and insomnia of constipation to indol, as he found that its administration by mouth to three healthy men produced these symptoms. But the dose required was much greater than the amount which is likely to be absorbed from the intestines in the severest cases of constipation, and the quantity in the urine bears no relation to the severity of these symptoms. It is, however, possible that individuals with an abnormal nervous system would react to much smaller doses than were required in the healthy men, on whom Herter experimented. Nothnagel believed that ptomaines might be the cause of some of the symptoms, but none have been found in either the urine or the fæces in constipation. Volatile fatty acids and most of the products of the bacterial decomposition of carbohydrates are rapidly oxidized in the body, so that they are not likely to produce any poisonous effects.

It is of course possible that the symptoms are due to the absorption of some unknown poisons. But no accurate means have yet been devised for investigating this possibility, as Bouchard's method of estimating the toxicity of urine and fæcal extracts, by finding how much is required to kill rabbits by intravenous injection, is quite unreliable.

Only two of the most obvious objections to the method need be mentioned:—substances which are very toxic for rabbits, such as potassium and ammonium salts—the chief ‘ poisons ’ normally present in the urine—are very slightly toxic for man, and a substance which is poisonous when injected subcutaneously, such as most bacterial toxins, egg albumin, peptone and curare, may be harmless when given by mouth and absorbed from the intestines.

Though there is thus no direct evidence that such a condition as copræmia exists, yet many of the results of constipation are more easily explained by the theory of auto-intoxication than in any other way. This is particularly the case with some of the nervous symptoms and with pyrexia, pigmentation of the skin and albuminuria.

This auto-intoxication is probably due to the abnormally long period during which the fæces are present in the intestines, and to the consequent excessive absorption of poisons, and not to any increase in bacterial decomposition.

Assuming, therefore, that auto-intoxication can result from constipation, it becomes necessary to inquire why some individuals are unaffected by prolonged retention of large quantities of fæces, whilst in others a postponement by a few hours of the daily evacuation at once causes considerable discomfort.

In the first place the intestinal poisons may be neutralized or destroyed in the process of absorption. Symptoms of auto-intoxication are particularly likely to occur if stercoral ulceration has been produced by the retained fæces. Not only is absorption more rapid from the raw surface than from the intact mucous membrane, but the intestine is deprived of the epithelium, which is probably the first line of defence in dealing with the poisons. The chief defence against intestinal auto-intoxication occurs, however, in the liver, as all substances absorbed from the alimentary canal must pass through it before reaching the general circulation, and one of its most important functions is to diminish the toxicity of all sorts of poisons. The products of protein putrefaction lose a large proportion of their toxicity in the liver owing to their conversion into less poisonous substances. Thus Nencki and Pawlow[12] showed that dogs with an Eck's fistula, by which the portal blood passes directly into the inferior vena cava so that the products of digestion do not come under the influence of the liver, quickly died when fed on a meat diet, but survived for a considerable time when given only a minimal quantity of protein. The liver converts ammonium salts into urea and the aromatic products of protein digestion into the comparatively innocuous ethereal sulphates. Hence when the liver is diseased excess of intestinal toxins reach the general circulation, and severe auto-intoxication may develop, especially if constipation is present. Other organs possess a similar power of neutralizing and destroying poisons, but to a much smaller extent.

Even after a considerable quantity of intestinal toxins have reached the general circulation no great harm need be done, if the excretory organs are efficient. But when the kidneys are diseased, the retention of poisons absorbed from the intestines may be a factor in the production of uræmia, especially if increased absorption occurs as a result of constipation. Only a very small proportion of the poisons absorbed from the intestines is excreted in the sweat, but it may be sufficient to account for the unpleasant odour which is said to emanate from the skin in some severe cases of constipation. It has often been stated that the breath is offensive in constipation, and Bouchard ascribed this to the excretion by the lungs of ammonia and various volatile poisons, present in excess in the blood owing to auto-intoxication. Haldane and Lorrain Smith,[13] however, showed that the unpleasant odour is due to decomposition occurring in the mouth owing to insufficient cleanliness, and that volatile organic poisons are never excreted by the lungs. When gastric digestion is upset and the tongue furred in constipated patients, it is often very difficult to prevent the occurrence of oral sepsis, so that the breath may be foul, although the expired air contains no poisons absorbed from the intestines.

Lastly, the production by intestinal auto-intoxication of symptoms referable to various organs depends upon the condition of these organs. If any part of the body is organically diseased, it is naturally much more susceptible to the action of poisons than under normal conditions. This accounts for the harmful effect of constipation and the importance of keeping the bowels regular in all chronic diseases. But functional diseases are of equal importance, particularly in connexion with the nervous system. There is no doubt that neurasthenia is aggravated by constipation, which is one of its most frequent symptoms. This is doubtless partly a result of auto-intoxication, poisons which would have no effect on a normal individual producing new symptoms and aggravating those already present, when the functional activity of the nervous system is depressed.

In some individuals the effects of chronic constipation become less obvious in course of time. This is perhaps due to the development of a partial immunity to the intestinal toxins. The same explanation may account for the fact that the symptoms produced by severe constipation are often less profound in patients, who have suffered from constipation since infancy, than in those in whom the condition has developed in adult life, as seen in the contrast between the two cases described in the introduction (p. 157). Apart from the production of immunity, different individuals show great differences in their susceptibility to poisoning by intestinal toxins, just as different individuals react very differently to such poisons as alcohol.

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[1] Robert Barnes: *Diseases of Women*, p. 143, second edition, 1878.

[2] Albert von Haller: *Elementa Physiologiæ Corporis humani*, vii, 188. Berne, 1765.

[3] Ch. Bouchard: *Leçons sur les auto-intoxications.* Paris, 1887.

[4] M. Jaffé: *Virch. Arch.*, lxx, 72, 1877.

[5] E. Baumann: *Zeitsch. f. Physiol. Chemie*, x, 123, 1886.

[6] H. Strauss and H. Philippson: *Zeitsch. f. klin. Med.*, xl, 369, 1900.

[7] H. Ury: *Deutsch. med. Woch.*, xxx, 700, 1904.

[8] R. Baumstark: *Arch. f. Verdauungskrankh.*, ix, 200, 1903.

[9] J. Strasburger: *Zeitsch. f. klin. Med.*, xliv, 413, 1902.

[10] C. A. Ewald: *Klinik der Verdauungskrankheiten*, iii, 101. Berlin, 1902.

[11] C. A. Herter: *New York Med. Journ.*, lxviii, 89 and 116, 1898.

[12] M. Nencki and J. P. Pawlow: *Arch. f. exp. Path. u. Pharm.*, xxxviii, 215, 1897.

[13] J. S. Haldane and J. Lorrain Smith: *Proc. Physiol. Soc.*, XI, xi, 1890.

CHAPTER II

REFLEX EFFECTS OF CONSTIPATION

There is no doubt that a good many of the minor symptoms of constipation are produced reflexly by the irritation of the mucous membrane of the colon and especially of the rectum by retained fæces. Thus it is within the personal experience of most people that the commonest symptoms of slight constipation—a dull headache and a vague discomfort in the abdomen, lumbar and perineal regions—disappear instantaneously or at latest a few minutes after the bowels have been well opened. Though the lumbar and perineal discomfort may be due to the direct pressure of the fæcal accumulation on various nerves, the headache must be produced reflexly, as it would be quite impossible for a symptom of auto-intoxication to disappear so rapidly. The reflex symptoms of constipation were well exemplified in the case of a man of fifty, who suffered from vertigo as a result of chronic retention of fæces in the rectum, the vertigo being always diminished when the bowels were opened. When first seen by Leube,[1] his bowels had just been opened and vertigo was absent, but it returned immediately in a severe form as a result of the local irritation produced by a digital examination of the rectum. The bowels were subsequently kept open by means of rhubarb powder, and there was no recurrence of the vertigo.

The reflex effects of constipation depend, like the toxic effects, upon the functional condition of the nervous system, as it is only the irritable nervous system of neurotic individuals, which is likely to be seriously upset by impulses ascending from the intestinal mucous membrane.

It is quite impossible in the present state of our knowledge to separate the nervous symptoms of constipation which result from auto-intoxication from those which are reflex in origin. The symptoms of constipation, with the exception of those which are obviously the result of direct pressure and difficult defæcation, will therefore be discussed under the headings of the different systems involved, and no attempt will be made to classify them according to their origin in auto-intoxication or reflex action.

[1] W. Leube: *Deutsch. Arch. f. klin. Med.*, xxxvi, 323, 1885.

CHAPTER III

EFFECTS OF PRESSURE BY FÆCAL ACCUMULATIONS

An accumulation of hard fæces rarely occurs in any part of the intestines except the pelvic colon and rectum. For this reason it is only in the pelvis that fæcal masses are likely to produce any symptoms by direct pressure. The small size of the pelvic cavity and the rigidity of its walls compared with those of the abdomen are additional reasons for the comparative frequency of pressure symptoms in the pelvis and their rarity in the abdominal cavity. The accumulation of fæces, which occurs in the rectum in dyschezia, is the most common cause of pressure symptoms, as the rectum is much less movable and is situated in a deeper and narrower part of the pelvis than the pelvic colon.

(*a*) **Veins.**—(1) *Hæmorrhoids.*—It has long been recognized that the most important factor in the production of hæmorrhoids is constipation.* The veins of the intestines as far as the end of the pelvic colon take a circular course round the gut and anastomose freely, so that the distension produced by the passage of fæces empties them in the direction of the blood-flow. The veins of the rectum, however, originate in a number of small venous pools, arranged in a circle just above the anus. The vessels which issue from them anastomose to form five or six slightly larger veins, which, after sending branches through the external sphincter to the inferior hæmorrhoidal veins, run upwards for about five inches and then pierce the muscular

* Thus W. Cullen (*First Lines of the Practice of Physic*, ii, 433, second edition. Edinburgh, 1789) writes: 'the voiding of hard and bulky fæces, not only by their long stagnation in the rectum, but especially when voided, must press upon the veins of the anus, and interrupt the course of the blood in them.'

coat of the rectum, on the outside of which they form by their union the superior hæmorrhoidal vein. Owing to the absence of valves from these longitudinal veins, the passage of fæces through the lower part of the rectum squeezes the blood out of them in a direction opposite to that of the normal blood-flow, so that the venous pools become distended. If defæcation occurs only once a day and the fæces are of normal consistence, no harm is done. But if, as a result of constipation, the fæces are hard and their expulsion is slow, the rise in intra-abdominal pressure, which occurs in defæcation, is unduly great and unduly prolonged, so that excessive engorgement of the hæmorrhoidal veins, and especially the venous pools from which they originate, occurs. Their walls consequently relax and hæmorrhoids are formed. The effect of difficult defæcation is well seen by telling the patient to strain during a digital examination of the rectum; the hæmorrhoids immediately become very prominent. Hæmorrhoids are particularly apt to occur if the venous flow is permanently obstructed by an accumulation of fæces in the rectum as a result of dyschezia. The thickness of the walls of the arteries protects them from compression, so that the inflow of blood is unimpaired, but the thin-walled veins are readily obstructed and the outflow is impeded. Owing to the looseness of the connective tissue in which the veins are situated, there is nothing to prevent them from becoming varicose under these circumstances.

The severity of the symptoms produced by hæmorrhoids depends mainly on the degree of constipation present. The expulsion of hard fæces may lead to their inflammation by producing slight lesions in the mucous membrane, which act as channels for infection. Bleeding from hæmorrhoids is probably not caused by direct injury inflicted by hard masses of fæces, but by the sudden increase in the distension of the weakened walls of the veins, produced when the expulsion of a large, hard fæcal mass squeezes the blood of the veins back into their varicose radicles.

Uncomplicated hæmorrhoids do not increase the constipation, to which they owe their origin. But if they are inflamed they give rise to reflex inhibition of intestinal movements as well as to spasmodic contraction of the anal sphincter, and the pain produced in defæcation is likely to cause the patient to defer it as long as possible, with the result that dyschezia is produced. When hæmorrhage is severe, the resulting anæmia is also likely to diminish the activity of the intestinal musculature.

(2) *Varicocele.*—It is very improbable that constipation by itself ever gives rise to varicocele, which occurs with greatest frequency in youths and young men, in whom constipation is comparatively rare. But varicoceles may occasionally be increased in size by severe constipation owing to the obstruction to the blood-flow in the left spermatic vein, produced by the pressure of a mass of hard fæces in the iliac colon. It is, however, so unusual for any considerable accumulation of fæces to occur in the iliac colon, that constipation cannot have anything to do with the much greater frequency of varicoceles on the left side than on the right, although it is only the left spermatic vein which can ever be compressed by a mass of fæces.

Pressure on the vaginal and uterine veins may give rise to congestion of these organs and the production of various symptoms, which will be described later (p. 196).

(3) *Œdema.*—Very rarely œdema of the left leg results from the pressure of a fæcal accumulation in the iliac colon on the femoral vein. It is generally accompanied by pain in front of the thigh owing to pressure on the anterior crural nerve (Warrington Haward[1]). But even with such immense fæcal tumours as that of Case 23 symptoms due to pressure on veins are extremely rare. In a remarkable case of Peacock's (p. 215), in which death resulted from constipation, there was œdema of the penis, scrotum and the skin over the legs and the lower part of the abdomen, as a result apparently of pressure of the enormous accumulation of fæces on the inferior vena cava.

(*b*) **Nerves.**—(1) *Nerves of the Rectum. Pruritus ani.*—Our recent investigations[2] on the sensibility of the alimentary canal have shown that the stomach and intestines are quite insensitive to tactile and thermal stimuli, but that the œsophagus and anal canal are sensitive. The whole of the alimentary canal is, however, sensitive to distension, which produces at first discomfort and subsequently pain. The rectum appears to be more sensitive than the rest of the intestines to distension, so that a large fæcal mass produces more discomfort when lodged in the rectum than in any other situation. As a result of this the normal accumulation of fæces in the pelvic colon is unaccompanied by any discomfort, whereas the entry of fæces into the rectum at once produces a sensation, which acts as a warning that defæcation is necessary. The discomfort produced by the presence of a large mass of fæces in the rectum is partly also due to the pressure it exerts on the upper extremity of the sensitive anal canal. Prolonged retention of fæces in the rectum leads to a blunting of its sensibility, so that comparatively little local discomfort is present in most cases of confirmed dyschezia. But in acute cases or cases of recent origin, in which the rectum is distended with fæces, much discomfort and occasionally severe pain is experienced. On the other hand, even a very large accumulation in the pelvic colon produces little or no discomfort in the intestine itself.

In cases of dyschezia in which the rectum has not yet lost its sensibility, defæcation is followed by a sensation of incomplete relief, owing to the evacuation having been only partial. This causes a constant desire to defæcate; but the frequent attempts never result in the evacuation of more than one or two small scybala. The condition, which was called 'fragmentary constipation' by Boas, is often aggravated by the production of catarrhal proctitis by the irritant action of the retained fæces on the rectal mucous membrane.

Matthews Duncan[3] was the first to call attention to the association of *pruritus ani* with incomplete evacuation of the rectum. It occurs most frequently in women suffering from dyschezia. The retention of a very small quantity of hard fæces just within the rectum or in the anal canal after defæcation, if the sensibility of the rectum has not become impaired by the prolonged presence of large quantities of fæces within it, leads to an exceedingly disagreeable local irritation, which is generally worst at night and may be sufficiently severe to interfere with sleep. Children sometimes discover that they can relieve themselves by introducing a finger into the anal canal, and it is generally found that the pruritus disappears on emptying the rectum by means of an enema. In the case of a woman described by Matthews Duncan enemata frequently failed to act; she then introduced her finger into the rectum and removed the fragments of fæces which were the cause of the irritation. The following interesting case of pruritus ani due to this cause was related to me by Dr. Alexander Bryce of Birmingham:—

The patient suffered ever since he was a boy of 9 from pruritus ani, which was sometimes so severe that he could only obtain relief by thrusting his finger into his rectum. A diagnosis of worms had been made, although none were ever discovered. When he was 23 years old, it was found that the pruritus was associated with the presence of a number of very small fæcal masses in the rectum, and that their removal by means of an enema always produced immediate relief. It was also observed that the pruritus occurred only if the bowels were for any reason opened before breakfast or in the evening instead of after breakfast, which was the time the patient defæcated most frequently. Probably the defæcation at other hours was less complete and so small masses of hard fæces were left in the rectum, where they caused pruritus by irritation of the mucous membrane.

(2) *Sacral plexus.*—A large fæcal accumulation in the rectum presses directly upon the anterior primary divisions of the third, fourth and fifth sacral nerve roots, as they emerge from the sacral foramina. It may therefore lead to neuralgic pain referred to the sacro-coccygeal region. It is liable to cause suffering more from its constant presence than its severity; it is often as severe when the patient lies down as when he takes exercise, but some relief follows flexion of the lumbar spine. The muscles of the buttocks and back of the thigh, which receive a small part of their sensory and motor supply from the third sacral nerve root, may be the seat of similar pain. Neuralgic

pain or paræsthesia, in the form of tingling or a sensation of heat or cold, may occur in the course of the sciatic nerve in the back of the thigh, and occasionally a sensation of cramp in the calf is produced. Pain is also occasionally felt in the hip-joint, which receives part of its nerve-supply from the third sacral nerve. The roots which supply the muscles of the front of the thigh are situated out of reach of the distended rectum, so that in the exceptional cases in which pain is produced by constipation in this situation, it must be due to pressure exerted by a fæcal mass in the iliac colon on the anterior crural nerve; it is accordingly only observed on the left side.

That these neuralgic pains are probably due to the direct pressure of a large and hard mass of fæces on the sacral nerve-roots is shown by their instantaneous disappearance on completely evacuating the rectum by enemata, a form of treatment which was already advocated for sciatica by Colunnius of Naples at the end of the eighteenth century.

Possibly the erections and seminal emissions, and the frequency of micturition and nocturnal incontinence, which occasionally result from large fæcal accumulations in the rectum, are due to direct irritation of the third and fourth sacral nerves, and are not reflex in nature. The spasm of the sphincter ani and levator ani muscles, which has already been described as an occasional complication of the fæcal impaction in the rectum which occurs in dyschezia, may perhaps be in part due to pressure on the fourth sacral nerve roots. Neuralgia of the testicles in men and dysmenorrhœa in women are sometimes increased by the direct pressure of fæces in the rectum on the nervous supply of the testicles and uterus respectively.

(*c*) **Genito-urinary organs.**—The results of pressure on the genito-urinary organs are often difficult to distinguish from the results of reflex action. They will be discussed in the next chapter.

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[1] Warrington Haward: *Lancet*, 1888, i, 811.

[2] A. F. Hertz, F. Cook, E. G. Schlesinger: *Journ. of Phys.*, xxxvii, 481, 1908.

[3] J. Matthews Duncan: *Med. Times and Gaz.*, 1879, ii, 521.

CHAPTER IV

SYMPTOMS DUE TO HARDNESS OF FÆCES AND DIFFICULTY IN EXPELLING THEM

(*a*) **Painful defæcation. Anal ulcer.**—When owing to constipation the fæces are hard and dry, their expulsion is often exceedingly painful, especially if they have united into a bulky mass, the pain then being sometimes very similar to that of labour. The effect of the passage of such hard bulky masses over internal hæmorrhoids has already been described. Their expulsion through the anal canal may produce an excoriation of its posterior wall, which develops into a small clean-cut superficial ulcer—the so-called anal fissure—unless means are taken to prevent the repetition of the irritation. As a result of the recurrent irritation and stretching of the ulcer during defæcation and the tendency for small particles of fæces to adhere to its surface, reflex spasm of the sphincter ani and levator ani muscles occurs.

An anal ulcer produces an amount of suffering, which is quite out of proportion to the extent of the lesion. The actual passage of fæces is not as a rule very painful, but within a few minutes a severe pain is felt just within the anus, which often radiates up the back, down the legs and to the genitals. In the course of a few minutes the pain generally subsides, but occasionally it lasts for some hours. Defæcation is often voluntarily postponed in order to avoid the pain, the hardness of the fæces and the severity of the constipation being thereby further increased.

Whenever defæcation is followed by great pain in the anal region the presence of an anal ulcer should be suspected. If an attempt is made to expose the ulcer, the anus retracts owing to muscular spasm, and occasionally an anæsthetic is required before the ulcer can be examined.

(*b*) **Effects of straining in difficult defæcation.**—In individuals, who are otherwise healthy, the straining to which constipation gives rise very rarely leads to any harmful result. The excessive and prolonged rise in intra-abdominal pressure obstructs the return of blood to the right side of the heart, and the blood-pressure rises. The face may be flushed and the cerebral congestion may produce headache and giddiness, which disappear almost immediately after the cessation of straining. The sudden great rise in blood-pressure may lead to the rupture of arteries, especially if they are already weakened by disease. I have even seen small petechiæ produced over the chest and face of a perfectly healthy girl of twenty-one by straining in an attempt to defæcate during a temporary attack of constipation, which was otherwise unaccompanied by symptoms. In individuals with degenerative changes in their arteries, especially if the blood-pressure is already high, as in cases of granular kidney, the sudden strain on the vessels produced by the further rise in pressure when a strong effort is made to defæcate may result in cerebral hæmorrhage. Similar straining may be the immediate cause of hæmoptysis in patients with tuberculous disease of the lungs, and it may also lead to the rupture of an aneurysm.

When the heart is feeble, particularly in elderly individuals with myocardial degeneration, it may be unable to cope with the sudden rise in blood-pressure produced by straining, when constipation is present, so that syncope results, and if the coronary vessels are diseased an attack of angina pectoris may be brought on. It is not unusual for such patients to die in the water-closet from sudden heart-failure.

It is thus a matter of extreme importance to keep the bowels regular in every individual, whose heart or blood-vessels are degenerated.

Straining at stool owing to constipation may be the exciting cause of hernia in predisposed individuals, especially if a high seat is used, as it is only in the squatting position that the hernial apertures are properly protected. Prolapse of the rectum may also occur, especially in children. The liability to prolapse is greatly increased when, as a result of a long illness or of malnutrition, the anal sphincters are atonic and the support by the fat in the ischio-rectal fossa is diminished owing to its partial absorption. The invagination of the mucous membrane of the upper part of the rectum into the lower as a result of straining has already been referred to (p. 152). Internal hæmorrhoids may also prolapse as a result of straining.

SECTION B

SYMPTOMS AND CONDITIONS ASSOCIATED WITH CONSTIPATION

CHAPTER I

PYREXIA

After operations, especially on the abdomen, and after parturition the temperature may rise if the patient is constipated, and the pyrexia immediately disappears when the bowels are thoroughly evacuated. Many authorities,[1] however, believe that slight infection of the wound is present in all cases of post-operative pyrexia, and that the temperature does not rise in the puerperium unless there is some local infection due to laceration of the cervix or perineum. Tweedy and Wrench[2] believe that in puerperal pyrexia associated with constipation the pyrexia is not a result of intestinal auto-intoxication, but is often due to retention of the lochia. This always tends to occur in civilized countries, owing to the absence in the supine position of the free drainage, which there is in the women of primitive races, who continue their ordinary occupations immediately after delivery; but when the bowels are opened, especially if the patient sits up to defæcate, the accumulated discharge is squeezed out. When, on the other hand, constipation is present, excessive retention occurs and the temperature rises. Tweedy and Wrench therefore give a purge the second evening after delivery with the object of opening the bowels several times the next day, the patient being instructed to sit erect in bed during defæcation.

Constipation often causes slight pyrexia during convalescence from typhoid fever; this is due to the unstable state of the nervous regulation of temperature, very trivial occurrences, such as mental excitement or constipation, being sufficient to produce a rise of temperature. In discussing this subject it should also be remembered that in various obviously infective diseases, such as erysipelas, the temperature can often be caused to fall by the administration of a purgative.

A number of writers regard constipation as the sole cause of a certain class of acute febrile attacks. An individual becomes suddenly ill with obstinate constipation and a rise of temperature, which is occasionally accompanied by a rigor ; the tongue is covered with a thick white fur ; vomiting may occur and the patient complains of flatulence, abdominal pain and headache, and in rare instances delirium may be present. Occasionally an urticarial or erythematous eruption appears, and slight jaundice and albuminuria have been observed. The attacks rarely last more than one or two days, and all the symptoms disappear immediately after a brisk purge has produced a thorough evacuation of the bowels. Attacks of this sort are more common in children than in adults, and have been described by various authors under different names.

The general character of these attacks is very similar to those resulting from acute food-poisoning, in which a purgative also often produces immediate improvement by getting rid of the offending material. It has not yet been conclusively proved that these attacks of 'fæcal fever' are not really due to food-poisoning. Possibly some of the slighter cases are the result of an acute catarrhal colitis, which is brought about by the irritation of retained fæces and cured by their evacuation. Thus evidence is still lacking to show that constipation is ever the sole factor in the production of a rise in temperature.

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[1] *Vide* O. Küstner : *Zeitsch. f. klin. Med.*, v, 186, 1882.

[2] E. H. Tweedy and G. T. Wrench : *Rotunda Practical Midwifery*, p. 345. London, 1908.

CHAPTER II

DISORDERS OF THE NERVOUS SYSTEM

(*a*) **Headache.**—Headache is one of the most common symptoms of constipation. Individuals, who are subject to headaches of any sort, are particularly liable to suffer when they are constipated. Thus *migraine* is almost always aggravated by constipation, and an attack may be brought on by this cause alone in predisposed individuals. The headache may occur even if the act of defæcation is only postponed for a few hours beyond the ordinary time, and in mild cases it is relieved almost instantaneously after the bowels have been opened; it must, under these circumstances, be due to afferent impulses from the rectum, produced by the irritation of retained fæces. In severer cases no improvement occurs until some hours after the colon has been completely emptied; the cause of the headache is then probably auto-intoxication, a considerable period being required to get rid of the poisons already in the blood.

(*b*) **Neuralgia.**—Though neuralgia is probably never produced by constipation alone, except when it results from pressure of fæcal accumulations on the sacral plexus (*vide* p. 169), there is no doubt that it can sometimes be relieved by securing regular evacuations. Sir Charles Bell[1] regarded many cases of trigeminal neuralgia as examples of ‘ sympathetic pain ’ resulting from intestinal disorders, as he found that they could sometimes be relieved by small doses of croton oil, when all other treatment had failed.

(*c*) **Mental and physical fatigue. Insomnia.**—Constipated individuals often feel tired all day and disinclined for either mental or physical exertion. They may suffer from insomnia, and they are liable to nightmare and are apt to wake unrefreshed. These conditions are quickly relieved by treating the constipation, a purgative acting in such cases as a more efficient hypnotic than opium. They result from auto-intoxication and the reflex produced by irritation of the rectal nerves by fæcal accumulations; the insomnia is often aggravated by the discomfort and colic, which are due to the over-action of the intestines caused by fæcal obstruction.

(*d*) In children **teeth-grinding**, restless and disturbed nights culminating in **night terrors**, and the much rarer **day terrors** are sometimes associated with constipation, the cure of which plays an important part in their treatment. The constipation is probably only an exciting cause, an underlying neurotic predisposition being probably the essential factor.

(*e*) **Neurasthenia. Hypochondriasis. Insanity.**—It has already been explained how neurasthenia, hypochondriasis and insanity give rise to constipation. Many authors believe that these conditions are the result rather than the cause of the constipation, as they claim to have cured the nervous condition by relieving the constipation. Such an event is, however, exceedingly rare, and the constipation may be completely cured without influencing the mental condition. All hypochondriacs are not constipated, and it is a common occurrence for a hypochondriac, when relieved of an intestinal complaint, which has been a source of worry for many years, to turn his attention at once to some other part of his body. The medical man, whose case was described on p. 74 (Case 7), had concentrated his thoughts for years on an imaginary stricture of his intestine; as soon as the normal condition of his bowels had been demonstrated to him and his constipation had disappeared, he asked to be catheterized, as he feared he must have a stricture of his urethra, although he had never had any difficulty in micturition. Many hypochondriacs worry about their hearts or their genital organs, and not their intestines. In these cases the mental condition is clearly not the result of auto-intoxication; it is therefore unreasonable to assume that the same mental condition, when associated with constipation, is not primary, but is due to poisons absorbed from the intestines.

It is commonly found that considerable improvement in these conditions results from treating the associated constipation. This is due to the fact that the intestinal auto-intoxication and the irritation of the nerve-endings in the rectum, which result from constipation, have much more effect upon an abnormal than on a normal nervous system. Thus constipation tends to exaggerate any abnormality already present, especially if this is in the nature of depression rather than excitement. As depressed conditions of the nervous system very readily lead to constipation, the association of neurasthenia, hypochondriasis and melancholia with constipation is exceedingly frequent, and each condition tends to aggravate the other.

(1) *Neurasthenia.*—Neurasthenia is always aggravated by constipation, which is one of its most common symptoms, especially in advanced cases. But it is important to recognize that the depression and feeling of anxiety, the lack of mental energy and concentration, the muscular weakness and rapid onset of fatigue after mental or physical exertion, the insomnia and pains in the head, eyes, neck and back, and the disturbances in the circulatory, digestive and genital functions are really the results of the depressed condition of the nervous system and not of the constipation, which is simply another of the manifestations of the neurasthenia. All the symptoms are likely to be exaggerated by the constipation and ameliorated by its relief, but its connexion with them is indirect and due entirely to its deleterious action on the already depressed nervous system.

(2) *Hypochondriasis.*—In many individuals with a depressed nervous system, the slightest dyspeptic symptoms, which would pass almost unnoticed in a normal individual, are at once observed and their importance is exaggerated. When constipation occurs in such people, the vague feeling of discomfort in the abdomen and the scanty stools lead to a sense of uneasiness, which sometimes develops into a definite fear that a ‘ block ’ may develop. The patient concentrates his whole attention on the state of his bowels and the size, shape and colour of his evacuations. He soon develops into a confirmed hypochondriac, who looks upon regular defæcation as a matter of vital importance, and who is in terror if his pill or his enema fails to act. His interest in his family, his business and his former pleasures are sacrificed to his

all-powerful interest in his health, and his relatives and dependants are made to feel an anxiety almost equal to his own as to the state of his bowels.

One doctor after another is consulted, and each new diagnosis is a new terror to the patient. I have recently seen a man, whose life had been rendered miserable by his being told that he had colitis and that he was being poisoned by auto-intoxication, although he was suffering from nothing more than slight constipation, the result of an unsuitable diet. Popular works on medicine are read with avidity, so that the patient obtains a confused idea of anatomy and pathology, which generally increases his misery by making him study his condition in still greater detail. The perusal of advertisements of quack medicines causes new symptoms to be looked for, with the result that some of them are produced by auto-suggestion. The patient desires to get well, but he is too impatient to follow systematically any course of treatment which does not produce immediate improvement, although he is generally willing to take any quantity of medicine and very often doses himself with drugs, which he has seen advertised or which have been recommended by lay friends. He often imagines that he has some fashionable surgical complaint, and he may manage to persuade a surgeon to remove his appendix, to fix his kidney or to re-arrange his gastro-intestinal tract. The mental effect of the operation often produces a slight improvement, but this is hardly ever permanent.

(3) *Insanity.*—A century ago it was the custom at Bethlem twice a week to purge every patient, irrespective of the nature of his mental symptoms or the condition of his bowels. The connexion between insanity and constipation was first scientifically investigated by Annesley,[2] who wrote in 1828 that in his opinion insanity was sometimes produced by constipation, and related several cases of melancholia and mania, which he claimed to have cured by purgatives. In a thesis published in 1890 Féyat[3] described some similar cases, but although the relief of the constipation was always followed by an improvement in the mental condition, complete recovery never resulted. Among recent writers on

insanity, Craig[4] in particular has laid stress on the important part played by constipation in its production.

In many cases constipation is present for a considerable period before the onset of insanity, so that it cannot be merely secondary to the mental condition. It is probably one of a number of factors which together lead to insanity in individuals, who have inherited an unstable nervous system. Hence its relief may lead to considerable improvement, especially in melancholia, but mental disease is so complex in its pathogenesis that recovery cannot be expected to follow the cure of the constipation alone.

(*f*) **Infantile convulsions. Epilepsy.**—In infants with an unstable nervous system, constipation may be an exciting cause of convulsions. In such cases attention to the bowels may prevent the recurrence of fits. Dr. Alan McDougall, the Director of the David Lewis Epileptic Colony at Sandle Bridge, tells me that he is convinced that constipation is an exciting cause of fits in the epileptic. It does not itself cause epilepsy, and epileptics are not more liable to constipation than normal people; but the fits can be often much diminished in number by seeing that constipation never occurs. When the fits become so frequent that the onset of *status epilepticus* is feared, constipation is almost always present, and the condition can often be prevented by thoroughly opening the bowels. It is at present impossible to say whether the connexion between constipation and epilepsy is due to auto-intoxication or to reflex action.

(*g*) **Ocular symptoms.**—Constipated patients sometimes complain that their eyes become very quickly fatigued and that they are troubled with *muscæ volitantes.* These symptoms are often temporarily relieved by aperients, but they are probably only indirectly connected with constipation, both the ocular and intestinal symptoms being due to the depressed condition of the general health, which is present in such cases.

(*h*) **Vertigo.**—Vertigo is not infrequently a result of constipation. It is often accompanied by tinnitus, and it occurs most frequently in individuals with atheroma and arteriosclerosis. The observations of Leube have already been described, which proved that vertigo is, at any rate in some cases, produced reflexly by the irritation of fæces retained in the rectum.

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[1] Sir Charles Bell: *Practical Essays*, iv, 101. Edinburgh, 1841.

[2] James Annesley: *Diseases of India*, ii, 113. London, 1828.

[3] M. Féyat: *De la Constipation.* Thèse de Paris, 1890.

[4] M. Craig: *Psychological Medicine*, p. 29. London, 1905.

CHAPTER III

GASTRIC DISORDERS

THERE is no doubt that constipation and disturbances in gastric digestion are very frequently associated, although it is often difficult to determine what is the exact connexion between the two conditions. The gastric disorder may be primary, the constipation may be primary, or both may be due to some common cause.

(*a*) **Primary gastric disorders.**—Constipation is very frequently present in both organic and functional gastric disorders. In most cases this is a result of the diet prescribed by the doctor or chosen by the patient himself containing too little of the substances, which act as mechanical and chemical stimulants to intestinal activity. Moreover, in many cases the patient eats an insufficient quantity of food for fear that pain may be produced by eating more. In organic obstruction of the pylorus and in other gastric disorders, in which vomiting is a prominent symptom, even if enough food is swallowed, the quantity that reaches the intestine is insufficient to produce an adequate stimulation.

Some continental authorities, who have paid special attention to the gastric chemistry in functional disorders of the stomach, have noticed a relation between the activity of the bowels and the quantity of hydrochloric acid secreted. It is a well-recognized fact that the majority of patients with achylia gastrica suffer from diarrhœa, which is due to the occurrence of excessive intestinal decomposition, owing to the absence of the bactericidal action of the normal gastric juice, and which can be relieved more readily by the administration of hydrochloric acid than by any other means. Adolf Schmidt[1] has, however, observed a number of cases of achylia gastrica associated with constipation, which he believes must be a result of a gastrogenous catarrh of the intestines. The constipation is at once relieved by hydrochloric acid. In contrast with this, the conditions associated with hyperchlorhydria are generally accompanied by constipation, which can often be promptly cured by a suitable diet and alkalies. Hyperchlorhydria may lead to some delay in the emptying of the stomach, but as no water and very little of the products of gastric digestion are absorbed in the stomach, this cannot account for the constipation. Most probably it is a result of too little food of a stimulating character being taken for fear that it would cause pain; the correction of the diet is therefore of greater importance than the administration of alkalies in such cases, although the latter acts beneficially by relieving the pain and thereby encouraging the patient to take more food. The excess of gastric juice and the consequent excessive secretion of pancreatic juice also lead to an unusually complete digestion and absorption of the food.

(*b*) **Primary constipation.**—Constipation is generally supposed to produce disturbances in gastric digestion. The chief symptoms of gastric disorder, which have been ascribed to constipation, are anorexia with consequent loss of weight, discomfort and even pain after food, especially in the form of heartburn with regurgitation of bitter fluid, nausea and occasionally vomiting and flatulence. At the same time the tongue is often furred, an unpleasant taste is present in the mouth, and the breath is offensive. According to Still,[2] chronic vomiting in infants of half an ounce or an ounce of fluid after each feed may result from constipation. It is claimed that these symptoms are the direct result of the constipation because their onset is either simultaneous with that of the constipation or follows the latter, and the cure of the constipation results in immediate relief of the gastric symptoms. No satisfactory explanation has been offered to account for the production of these symptoms by constipation. They have been regarded by some as a result of auto-intoxication, and by others as a result of the close physiological connexion of the different parts of the alimentary canal with each other, owing to which disturbance of the functions of one upsets the functions of another.

There is no doubt that even slight temporary constipation leads to anorexia, a vague feeling of abdominal discomfort and sometimes nausea. But these symptoms are not definitely gastric in origin, and may just as well be due to the influence exerted by constipation on the nervous system, either reflexly or by auto-intoxication, as to gastric indigestion produced by constipation. Mathieu[3] has shown that constipation has no constant effect on the secretion of gastric juice, which is often perfectly normal; when abnormal, hypochlorhydria and hyperchlorhydria are of equally frequent occurrence. In many cases, in which dyspepsia is associated with constipation, there is a vicious circle at work. Owing to the anorexia produced by the constipation too little food is taken: this not only aggravates the constipation, but it also tends to produce atonic dyspepsia, both of which conditions react harmfully on each other.

With regard to the abdominal discomfort, it is rarely possible to determine with certainty in what organ it originates. Trousseau long ago pointed out that pain produced in the colon may be mistaken for gastralgia, as, for instance, in cases of constipation, in which colic occurs as a result of partial obstruction.

(*c*) **Gastric disorder and constipation secondary to a common cause.**—In many cases in which dyspepsia is associated with constipation, both conditions are secondary to a common cause, the most frequent being chlorosis, neurasthenia and visceroptosis. The gastralgia and vomiting which occur in chlorosis often lead to the selection of a very unstimulating diet, and the anorexia of neurasthenic dyspepsia results in too little food being taken. Thus in both cases the dyspepsia exerts a harmful influence on the constipation, which in turn is likely to increase the abdominal discomfort and anorexia, so that the two conditions, though primarily due to a common cause, react unfavourably on each other. Both the dyspepsia and the constipation in such cases improve most rapidly when the primary condition is treated, but the best results are obtained if, in addition, the gastric and intestinal disturbances are at first also treated symptomatically.

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[1] A. Schmidt: *Die Funktionsprüfung des Darmes*, p. 70, second edition. Wiesbaden, 1908.

[2] G. F. Still: *Common Disorders and Diseases of Children*, p. 200. London, 1909.

[3] A. Mathieu: quoted by M. Loeper and C. Esmonet in *Manuel des Maladies du Tube digestif* (Debove, Achard, and Castaigne), ii, 408. Paris, 1908.

CHAPTER IV

DISEASES OF THE LIVER AND GALL-BLADDER

(*a*) **Jaundice.**—The occurrence of constipation in jaundiced individuals has already been discussed. Occasionally slight jaundice seems to result indirectly from constipation, as free purgation results in its rapid disappearance. Probably such cases are explained by the association with constipation of a duodenal catarrh, which leads to partial obstruction to the flow of bile into the intestine. Fæcal accumulation is so rare in any part of the colon on the proximal side of the splenic flexure that it is hardly surprising that obstruction to the biliary passages by a fæcal tumour has never been recorded, except perhaps in the remarkable case recorded by Frerichs and described elsewhere (*vide* p. 211), in which the tumour had been mistaken for a pregnant uterus.

(*b*) **Congestion of the liver.**—Bright[1] believed that constipation may result in congestion and enlargement of the liver, which may be accompanied by jaundice. He refers to cases in which an enlarged liver rapidly returned to its normal size after the administration of purgatives. The only recent writer, who claims to have observed congestion of the liver resulting from constipation, is Crämer,[2] who ascribes it to the effect of excessive absorption of intestinal toxins. In some cases he found that the spleen was enlarged as well as the liver. I have myself never seen a case of hepatic or splenic enlargement, which could be ascribed with any degree of probability to constipation.

(*c*) **Cirrhosis of the liver.**—Constipation is frequent in cirrhosis of the liver. This has generally been regarded as due to impaired activity of the intestinal musculature resulting from chronic portal engorgement. But it has been shown that carbon dioxide stimulates and oxygen inhibits peristalsis, so that congestion alone should result in diarrhœa rather than constipation. The constipation is more probably due to the unstimulating diet generally given to patients with cirrhosis, and to some of the complications of the disease. When ascites is present, especially if the fluid accumulates rapidly as a result of chronic peritonitis, there is a drain on the body fluids and the fæces become abnormally dry; at the same time the abdominal muscles are stretched and weakened, and defæcation becomes difficult. The chronic catarrh of the intestines, which frequently occurs in cirrhosis of the liver as a result of portal congestion, may cause constipation by diminishing the intestinal secretions and by leading to secondary atony of the intestinal musculature.

Constipation is particularly likely to produce auto-intoxication in cirrhosis, as the diseased condition of the liver results in a diminution in its capacity of dealing with poisons, the absorption of which is increased in constipation, even if there is no excessive intestinal putrefaction.

(*d*) **Cholelithiasis.**—Kraus[3] of Karlsbad found that more than 80 per cent. of his 2,269 patients with gall-stones were constipated. The cause of this frequent association is not clear, although it is doubtless partly due to the fact that obesity and a sedentary life frequently lead to both conditions, which are not therefore directly connected with each other. In some cases the excessive use of purgatives in the treatment of constipation may lead to duodenal catarrh, which favours the development of cholecystitis and the production of gall-stones. The medicinal treatment of cholelithiasis largely consists in the use of aperients, as the cure of the associated constipation appears to have a good effect on the condition of the biliary passages.

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[1] R. Bright: *Guy's Hosp. Reports*, v, 304, 1840.

[2] Fr. Crämer: *Darmatonie*, pp. 141 and 164. München, 1906.

[3] J. Kraus: *Gall-stones*, p. 20. Eng. Trans., London, 1896.

CHAPTER V

INTESTINAL FLATULENCE

The gas in the intestines is derived from two sources. (i) The greater part is derived from bacterial decomposition of carbohydrates and, to a much less extent, of proteins. (ii) The remainder is derived from the air, small quantities of which are always swallowed with solid or liquid food: the oxygen is quickly absorbed in the stomach, but some of the nitrogen reaches the intestines. It was formerly believed that much of the carbon dioxide present diffused from the blood-vessels of the intestinal mucous membrane, but it is now known that this does not normally occur.

In health the tension and volume of the intestinal gases does not vary greatly, the same amount being eliminated each day as is added to the volume already present. The elimination is chiefly (i) by absorption, but (ii) a varying, but always small, quantity is normally expelled as flatus.

Excess of gas in the intestines—intestinal flatulence—may result from (*a*) excess of gas being added to that already present, or (*b*) too little gas being eliminated.

(*a*) Excess of gas may be added to that already present as a result of (i) excessive production of gas by fermentation and putrefaction, and (ii) excessive swallowing of gas.

(i) It has already been shown that there is no evidence that excessive bacterial decomposition occurs in constipation. The diet most commonly ordered for constipated patients is, however, one which is liable to give rise to flatulence, as much more gas is produced from fermentation of carbohydrates than from putrefaction of proteins, and cellulose is the carbohydrate which undergoes bacterial decomposition to the greatest extent. It is therefore often found that in the early stages of the dietetic treatment of constipation intestinal flatulence occurs, but, as the constipation improves, this disappears with the return of the normal elimination of gas.

(ii) Intestinal flatulence may also result from excessive swallowing of air—aerophagy—which frequently occurs in nervous dyspepsia. This is, however, not specially associated with constipation.

(*b*) Too little gas is eliminated from the intestine owing to (i) deficient absorption or (ii) deficient expulsion.

(i) It has been proved that deficient absorption of gas occurs when the intestinal mucous membrane is inflamed. Hence in catarrhal colitis, which is frequently associated with constipation, flatulence is generally present.

(ii) Intestinal flatulence frequently results from the sluggish action of the intestines in some forms of constipation, as it causes retention of gas as well as of fæces. This may be very great in the exceptional cases, in which a mass of fæces has become impacted in the intestines in such a way as to obstruct the lumen completely. Voluntary retention of gas in the intestines for the sake of decency, especially when gas is present in excess, prevents the natural relief of intestinal flatulence. The Emperor Claudius made an effort to overcome the popular opinion that to allow the escape of wind is an offence against decent manners by issuing an edict, which made it lawful for any Roman '*flatum crepitumque ventris in convivio emittere*'.[1]

Not only does constipation lead to intestinal flatulence, but the distension of the intestine with gas, resulting in these various ways, is a cause of constipation, as it increases the work to be done by the intestinal muscles at the same time as it impairs their contractile power (p. 56).

Intestinal flatulence gives rise to a sensation of fulness and pressure in the abdomen. When severe, the distension may lead to palpitation and dyspnœa by pushing the diaphragm upwards and interfering with its movements. This is most likely to occur in patients with strong abdominal muscles, as when they are weak the distended intestines push the abdominal wall outwards, so that upward expansion is diminished.

Distension of the intestines acts as a stimulant to their contractions, so that flatulence is often associated with colic. One of the most frequent causes of constant screaming in infants is flatulent colic resulting from constipation. This form of colic is at once relieved on passing flatus.

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[1] Suetonius: *Vita Claudii*, cap. xxxii.

CHAPTER VI

VISCEROPTOSIS

The cause of the frequent association of constipation with visceroptosis has already been explained (p. 133). Many of the symptoms due to ptosis of the stomach, intestines, kidneys, liver and spleen are often ascribed to the constipation, but erroneously, as they show little or no improvement when the bowels are opened, whereas effective treatment of the weak abdominal muscles simultaneously relieves the constipation and the symptoms of visceroptosis. Under normal conditions the abdominal wall and pelvic floor are the only support of the viscera; the peritoneal folds help to maintain them in position, but they do not support their weight. Hence weakness of the muscles of the abdominal wall and of the pelvic floor allows the viscera to drop when the individual is erect, and a pull is exerted on the peritoneal folds, which become true suspensory ligaments. This pull gives rise to a constant slight irritation of the sensory nerves of the peritoneum, which results, especially in individuals with an enfeebled nervous system, in a vague feeling of abdominal discomfort, often described as weight or pressure, but rarely amounting to actual pain. In the case of the stomach, the discomfort is aggravated by increasing its weight, the quantity and not the quality of the food being of importance; thus milk produces just as much disturbance as an equal weight of solid food. The discomfort at once disappears when the pull on the peritoneal attachments is prevented by lying down or by pressing upwards the lower part of the abdomen by the hand, but it is increased by exercise and to a less extent by mental fatigue or excitement. The relief can be rendered permanent by using an abdominal belt or by strengthening the abdominal muscles by exercise, massage and electricity. If, on the other hand, the constipation, which is almost invariably present, is alone treated, the abdominal discomfort remains unaltered. It is thus clear that the abdominal discomfort, which is associated with constipation in individuals with weak abdominal muscles, is a result of the visceroptosis and not of the constipation. In patients suffering from abdominal discomfort and constipation, a history of relief on lying down suggests that visceroptosis may be the cause of the trouble. This can be confirmed by observing the physical signs of ptosis of the various organs, and by examining the condition of the abdominal walls and, if necessary, of the pelvic floor.

Some writers teach that constipation may give rise to ptosis of the colon. According to Arbuthnot Lane the weight of the fæces, which he believes accumulate in all parts of the large intestine in constipation, causes the cæcum to become dilated and elongated until the lower extremity may even reach the floor of the true pelvis; the transverse colon undergoes similar changes and in advanced cases its most dependent part reaches the pelvis. But the diagram, with which he illustrates the supposed anatomical results of constipation, shows the transverse colon in a position which in normal individuals is more frequent than the position shown in his diagram of the 'normal' colon, and the acuteness of the hepatic and the splenic flexures is not greater than is often observed in healthy people with regular bowels. In two perfectly normal young men I have seen the shadow of the cæcum just within the pelvic brim, but neither in normal nor in constipated individuals have I ever seen the shadow of the cæcum as large or as low as in Lane's diagram of the abnormal colon, nor have I been present at an operation or an autopsy in which such a cæcum was found. The condition represented must therefore be most exceptional, and it can hardly be a result of constipation, as fæcal retention in the cæcum, as has already been shown, scarcely ever occurs.

Large fæcal accumulations occur most frequently in the pelvic colon. This part of the intestine, when empty, is generally situated in the recto-vesical fossa or Douglas's pouch, and rises into the abdomen as soon as it becomes filled with a moderate quantity of fæces and gas. But when an excessive amount of fæces is present, and when it is never more than partially evacuated, the weight of the fæces causes it to remain permanently in the dependent position.

A heavy accumulation of fæces in the pelvic colon may give rise to pain or discomfort by the constant pull it exerts on the attachments of its mesentery. As this passes obliquely from the left lumbar region into the pelvis, the pain is felt in the left loin. It is sometimes relieved by bending to the left, and, according to Warrington Haward,[1] it may consequently give rise to lateral curvature of the spine, especially in anæmic girls.

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[1] Warrington Haward: *Lancet*, 1888, i, 811.

CHAPTER VII

RESPIRATORY DISORDERS

(*a*) **Asthma.**—All writers on asthma have emphasized its frequent association with dyspepsia and the extreme importance in its treatment of regulating the diet and especially the time at which meals are taken. It is remarkable, however, how little attention has been paid to the association of constipation with asthma: thus Hyde Salter in his classical work on asthma, published in 1868, did not even mention constipation. But Ebstein[1] in his book on constipation quotes the following, as typical of several cases of asthma, cured by treatment of the associated constipation:—

A boy of 8, who had suffered for two years from asthma, was found by abdominal examination to have an accumulation of fæces in his colon. Treatment by oil enemata for three periods of three weeks each resulted in complete relief, which was maintained eight months later, when the patient was last seen.

From my own personal experience and from observations on numerous patients I can fully confirm Ebstein's belief in the importance of the association of constipation with asthma.

During each period, in which an asthmatic patient has a series of attacks, there is always a tendency to constipation. This is partly due to the fact that comparatively little food is eaten, as the patient soon learns from experience that nothing relieves his condition more than extreme moderation in the size of his meals. It is also partly due to inability to produce during defæcation an adequate rise in intra-abdominal pressure, owing to the dyspnœa making it impossible to strain and to the diaphragm being already very low because of the inflated condition of the lungs.

In the periods of complete freedom from asthmatic attacks the slightest constipation is often immediately followed by slight difficulty in respiration, which may develop in the evening into a definite attack of asthma. If, under these circumstances, the bowels are well opened, the relief to the dyspnœa is so nearly instantaneous that it is impossible to account for the dyspnœa in any way except as the result of a reflex from the irritation of the rectum by an accumulation of fæces. This view is borne out by the fact that the constipation in most cases is accompanied by the sense of fulness and pressure in the perineum, which is felt when a mass of fæces is present in the rectum. The respiratory reflex from the rectum is well seen in the deep respirations, which occur when the anal canal is stretched under an anæsthetic.

The constipation, which so frequently occurs as a result of a series of asthmatic attacks, undoubtedly increases their severity, and it tends particularly to increase that feeling of slight dyspnœa, which is almost always present during the daytime, when nocturnal attacks are frequent. By keeping the bowels well opened considerable relief can be obtained. The two worst attacks of asthma which I have seen were suddenly cut short by the unexpected evacuation at three o'clock in the morning of a very copious watery stool.

(*b*) **Emphysema.**—Severe emphysema is often accompanied by dyschezia; this is a result of the depression of the diaphragm which is produced, as in asthma, by the inflated condition of the lungs. The constipation tends to increase the dyspnœa, from which emphysematous patients are liable to suffer.

(c) **Dyspnœa apart from definite pulmonary diseases.**—Constipation occasionally produces dyspnœa, even in individuals who have no emphysema and are not asthmatical. Thus I saw in 1906 a man of twenty-one, who for three days had severe dyspnœa, accompanied by vomiting, flatulence and general tenderness of the abdomen. He had been constipated for years, but had otherwise always been perfectly healthy. A large accumulation of fæces was found in his rectum, and all the symptoms disappeared as soon as this had been evacuated by enemata.

In his thesis on senile constipation Stroup [2] calls attention to the occurrence in old men and women of attacks of respiratory distress, unaccompanied by tachypnœa or adventitious sounds heard on auscultation. They occur equally frequently during the day and the night, and do not last for more than an hour; they are associated with constipation, the cure of which results in a cessation of the attacks. They are probably reflex in origin, and are not due to distension of the abdomen with gas, as flatulence is not necessarily present. Stroup also observed in other cases of senile constipation that the regular rate of respiration was from thirty-two to thirty-six per minute and returned to normal as soon as the bowels were well opened. This tachypnœa was not accompanied by any distress, the patient feeling perfectly comfortable all the time.

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[1] W. Ebstein: *Die chronische Stuhlverstopfung*, p. 227. Stuttgart, 1901.

[2] A. Stroup: *Recherches sur la Constipation chez le Vieillard.* Thèse de Nancy, 1893.

CHAPTER VIII

CIRCULATORY DISORDERS

According to Ebstein constipation is not infrequently the cause of various functional disturbances of the circulation, the most frequent of which is palpitation with irregularity of the heart. But the evidence that the palpitation is due to the constipation is not very convincing. More probably it is simply a result in neurotic individuals of an abnormal elevation of the diaphragm, owing to the flatulent distension of the stomach and intestines, which is often associated with constipation.

Attacks of syncope, angina pectoris and various vasomotor disturbances, such as coldness of the extremities and flushing, have been ascribed to auto-intoxication produced by constipation. It is, however, much more probable that the association is either purely accidental or that the circulatory and intestinal derangements are both due to a common cause, such as neurasthenia.

Constipation frequently occurs in heart failure, because of the impossibility of exerting a sufficient effort to produce a complete evacuation of the bowels; the absence of exercise and the unstimulating character of the diet are other factors in its production. It is very important to keep the bowels regularly opened in such cases, as constipation always aggravates the flatulence, which tends to develop in heart failure, and straining at stool is very dangerous for individuals with heart disease.

According to Federn[1], constipation may lead to a rise in blood-pressure, which slowly returns to normal when the action of the bowels is regulated. This appears to be a result of vaso-constriction, which can equally well be reflex in origin or be due to irritation of the vasomotor centre or muscular coat of the blood-vessels by poisons absorbed from the intestines. Chronic constipation may thus perhaps be a factor in the production of *arteriosclerosis*, especially if the rise in blood-pressure is wholly or in part due to the direct action of poisons on the blood-vessels.

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[1] S. Federn: *Blutdruck u. Darmatonie.* Leipzig, 1894. Quoted by Fr. Crämer: *Darmatonie,* p. 149. München, 1906.

CHAPTER IX

DISORDERS OF THE URINARY SYSTEM

(*a*) **Movable kidney.**—Movable kidney is so common that its association with constipation must often be quite accidental. In many cases it is simply a part of a general visceroptosis, the result of weak abdominal muscles. As the latter condition often leads to dyschezia, dyschezia and movable kidney are frequently present in the same individuals.

According to Arbuthnot Lane, however, the right kidney may become movable because of the traction exerted by an overloaded ascending colon and cæcum on the kidney, the lower pole of which has become firmly adherent to the hepatic flexure from inflammation of the wall of the gut, produced by the constipation itself or by old peritonitis of tuberculous or appendicular origin. But it has already been pointed out that it is very rare, even in severe cases of constipation, for the cæcum and ascending colon to be the seat of fæcal accumulations, so that the production of a movable kidney in this way must be very exceptional. Moreover, Cameron and Mollison have shown that the adhesions between the kidney and the hepatic flexure are not the result of constipation. In the rare cases in which firm adhesions exist between the hepatic or splenic flexure and an already movable kidney, the descent of the latter may result in partial obstruction of the colon. In such cases the constipation may be relieved by supporting the kidney by a suitable belt, or, in the very rare instances in which this cannot be done, by the operation of nephrorrhaphy.

Thus Franks[1] describes the case of a constipated woman, who was operated on for mobility of the left kidney, as an abdominal belt only partially relieved her; an adhesion was found between the kidney and the splenic flexure, and it was clearly demonstrated that the descent of the kidney caused a kink in the colon. Nephrorrhaphy was followed by complete cure of the constipation.

(*b*) **Albuminuria and cylindruria. Nephritis.**—Occasionally in acute attacks of constipation, and much less frequently in chronic constipation, traces of albumin are found in the urine. In other cases a few hyaline casts, which are sometimes accompanied by leucocytes, are found, or albumin and casts may be present together. These abnormalities disappear as soon as the bowels are opened regularly, and no development of organic disease of the kidneys has been observed, even in cases which, like one of Ebstein's, have been under observation for years.

Ebstein[2] records the case of a girl of 19, who complained of palpitation and headache and was supposed to have chronic nephritis, as her feet were swollen and her urine contained a little albumin and occasionally a few casts. Her colon was found by abdominal palpation to contain a considerable accumulation of fæces ; treatment by means of large enemata of oil and of water for two months resulted in the complete disappearance of all the symptoms and the urine became normal, so that Ebstein believed that the condition was due entirely to the action on the kidneys of toxins, absorbed as a result of constipation.

As there is no doubt that constipation can cause albuminuria and cylindruria in people with normal kidneys, it is clearly of great importance to prevent the occurrence of constipation in patients whose kidneys are diseased, as diseased kidneys are probably more easily injured than normal kidneys by the toxins absorbed from the intestines. Purgatives are often given in threatened uræmia with the object of eliminating by the bowels poisons, which the diseased kidneys are unable to excrete. It is, however, probable that the benefit derived from their use is in part also due to the diminished absorption from the intestines of substances, which are injurious to the diseased renal epithelium.

(*c*) **Pyelitis and pyelonephritis.**—The flexures of the colon being in contact with the kidneys, infection of the renal pelves may occur by the direct passage of the *bacillus coli communis* from the intestines when stagnation of fæces occurs. My attention was first drawn to this condition by Professor Friedrich Müller of Munich, who has shown that pyelitis is not at all a rare complication of constipation in women and children. In these cases micturition becomes extremely frequent, and in children nocturnal enuresis may occur ; the urine, which remains acid, contains pus, epithelial cells and many *bacilli coli communis*. The right kidney is often painful and tender ; the left kidney, which is in less intimate contact with the colon, is much more rarely affected. There is generally pyrexia, which may last for only a few days or may continue with intermissions for weeks. Tuberculosis, typhoid fever or appendicitis may be simulated. The condition is generally rapidly cured by urotropine, but in rare cases slight albuminuria may remain. Recurrences are very apt to occur if the constipation is allowed to return.

Pyelitis is particularly likely to result from constipation in pregnant women, in whom it also occurs most frequently on the right side, owing probably to the fact that the pregnant uterus is generally inclined towards the right and so produces more pressure on the right than the left ureter. Thus the right ureter has been found to be much dilated in such cases, the dilatation beginning at the level of the pelvic brim, which is the point where the greatest pressure is exerted. The urine is very readily infected, owing to the stagnation which results from the partial obstruction to the ureter.

The kidneys rarely become involved in cases which are not associated with pregnancy. In pregnancy, however, the pyelitis may develop into pyonephrosis or pyelonephritis, as in a case under my care in 1908: the patient recovered after drainage of the right kidney, which was riddled with abscesses.

(*d*) **Disorders of micturition.**—Difficulty in micturition may result in old men from congestion of an enlarged prostate, caused by the irritation of a fæcal mass in the rectum, the slight enlargement of the organ being just sufficient to make the previously negligible obstruction too great for the expulsive powers of the bladder to overcome. Warrington Haward[3] records the case of a man of seventy-five, who, having passed a catheter for prostatic enlargement every day for ten years without difficulty, was on one occasion unable to introduce it owing to the impaction of a large quantity of fæces in the rectum.

Constipation is frequently a factor in the production of nocturnal enuresis in children. In such cases there is an accumulation of fæces in the rectum, which causes involuntary micturition by direct irritation of the neck of the bladder, and perhaps also by pressure on the fourth sacral nerve, experimental stimulation of which causes the bladder to expel its contents. Distension of the rectum with fæces may give rise to frequent and painful desire to defæcate in adults also. Owing to the intervention of the uterus and vagina, the bladder is less affected by a loaded rectum in women than in men.

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[1] K. Franks: *Twentieth Cent. Pract. of Med.*, ix, 798. London, 1897.

[2] W. Ebstein: *Die chronische Stuhlverstopfung*, p. 233. Stuttgart, 1901.

[3] Warrington Haward: *Lancet*, 1888, ii, 811.

CHAPTER X

DISORDERS OF THE ORGANS OF GENERATION

(*a*) **Male organs of generation.**—The effect of fæcal accumulations in the rectum on neuralgia of the testicles and varicoceles has already been considered. The prolonged presence of large quantities of fæces in the rectum in dyschezia may cause erections and spermatorrhœa, partly by direct pressure on the third and fourth sacral nerves and partly by reflex action. These results of fæcal impaction are most frequent in neurotic individuals, and are the occasion of much distress to the patient, who often regards them as evidence of impending impotence or insanity.

When as a result of constipation very large and hard masses of fæces are expelled from the rectum, the pressure on the vesiculæ seminales may cause semen to be simultaneously expelled. As a rule, however, when a patient believes that semen is emitted during defæcation, microscopical examination shows that no spermatozoa are present, the fluid being really prostatic secretion, which is squeezed out of the prostate by the pressure of the fæces: this was the case in five consecutive cases examined by Curschmann.[1]

(*b*) **Female organs of generation.**—Abnormal accumulations of fæces in the rectum and pelvic colon press upon the venous plexuses of the uterus and vagina and lead to congestion of these organs. Kelly[2] has observed during operations large varices in the broad ligaments, which he believes are produced in this way. The congestion results in a feeling of weight in the pelvis and aching in the lower part of the back. All the pelvic viscera become abnormally sensitive; pruritus may occur and lead, as Kelly suggests, to masturbation. Leucorrhœa has been said to result from the congestion produced by constipation, but this is probably not the case.

Dysmenorrhœa is always aggravated by constipation; in young girls it may be completely relieved by keeping the bowels regular or even a little relaxed during the menstrual period.

The disturbances in the female genital organs produced by constipation may be partly due to pressure on their nerves as well as on their veins.

Amenorrhœa is frequently present in chlorosis, and is often associated with constipation, but there is no direct connexion between the two conditions.

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[1] H. Curschmann: *Functional Affections of the Male Genital Organs*, in Ziemssen's *Cyclop. of Med.*, viii, 846. Eng. Trans., 1878.

[2] Howard A. Kelly: *Medical Gynecology*, p. 190. New York, 1908.

CHAPTER XI

DISORDERS OF METABOLISM

(*a*) **Diabetes.**—Constipation is very frequent in diabetes; Saundby[1] states that he has seldom made an autopsy on a diabetic patient without finding the colon filled with hard masses of fæces. The chief cause of the constipation is the increased resistance offered by the fæces, which are hard and dry as a result of the excessive secretion of water by the kidneys. The absence of vegetable food from the diet and the administration of opium or its derivatives are frequently accessory factors.

Constipation is a symptom of considerable danger in severe diabetes, especially in the young. According to Williamson,[2] diacetic acid is rarely found in the urine in the absence of constipation, and the quantity often diminishes or it actually disappears when the constipation is relieved.

Seventeen out of twenty-seven cases of diabetic coma, recorded by Williamson, were preceded by obstinate constipation, and only one by diarrhœa. The premonitory and early symptoms of coma are often relieved by purgatives; it is probable therefore that diabetic coma is in part due to the increased absorption in constipation of toxins produced from the putrefaction of proteins, which are generally present in excess in the diet of diabetics. This theory helps to explain the generally recognized importance of diminishing the proteins and giving more carbohydrates when coma is threatened.

Crämer[3] has seen a dozen cases of slight glycosuria associated with 'atonic constipation'; they were unaccompanied by polyuria or other symptoms of diabetes. They were cured by treating the constipation, a return of which was followed by a return of the glycosuria. In the few cases, which were watched for several years, no true diabetes developed.

(*b*) **Gout.**—There does not seem to be any direct association between gout and constipation. Many gouty individuals, however, suffer from constipation owing to their sedentary life and their rich diet, which contains too little indigestible matter. The diet, which is best for gouty individuals, also tends to relieve constipation. Hence, by taking more exercise and a more suitable diet, both the constipation and the frequency of the gouty attacks are often diminished.

(*c*) **General nutrition. Wasting. Obesity.**—Constipation has no direct influence on metabolism, beyond causing a more complete absorption of water and foodstuffs from the intestines than occurs when the passage through the alimentary canal is undelayed. This does not, however, lead to improved nutrition, as it is neutralized by the poor appetite, which is generally present in the severer cases. The emaciation, which is sometimes associated with constipation, has been ascribed to excessive katabolism resulting from intestinal auto-intoxication. But accurate investigations have shown that metabolism is quite unaffected, the loss in weight being due solely to an insufficient quantity of food.

According to Still,[4] failure to gain in weight or very slow bodily development in infants is frequently caused by constipation, the weight beginning to rise as soon as the bowels are regulated by a daily aperient without any change in diet being made.

Many fat people are constipated. A number of different causes, most of which have already been mentioned, act together in producing the constipation. In very fat people fatty infiltration may interfere with the contractile power of the intestinal musculature, lack of exercise deprives the alimentary canal of an important stimulus to its activity, and loss of fluid as a result of excessive sweating leads to dryness of the fæces. To the slow passage through the intestines may be added dyschezia, which results from the weakness of the abdominal muscles, caused by want of exercise and over-stretching by the excessive accumulation of fat in the abdomen.

Constipation may be a very troublesome symptom in the obese. The atonic condition of the intestinal musculature and the partial obstruction caused by fæcal accumulations in the distal part of the colon may readily lead to severe flatulent distension of the colon. By pushing the diaphragm upwards this tends to increase the dyspnœa, which is often already present in fat individuals from other causes. Hence considerable relief to the most unpleasant results of obesity is often produced by increasing the activity of the intestines. It is not difficult to arrange a diet which is good for the constipation and at the same time tends to reduce the weight, if those foods are chosen which act rather as mechanical than chemical stimulants of intestinal activity.

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[1] Robert Saundby: *Lectures on Renal and Urinary Diseases*, p. 380, fourth edition. Bristol, 1900.

[2] R. T. Williamson: *Diabetes Mellitus*, pp. 204 and 275. London, 1898.

[3] Fr. Crämer: *Darmatonie*, p. 121. München, 1906.

[4] G. F. Still: *Common Disorders and Diseases of Children*, p. 200. London, 1909.

CHAPTER XII

CHLOROSIS

James Hamilton, in his book on the *Action of Purgatives*, published in 1805, devoted a whole chapter to the consideration of the production of chlorosis by constipation. In 1886 Sir Andrew Clark[1] revived the theory, which was strongly supported by Bouchard and Nothnagel. According to Clark, constipation due to tight-lacing, insufficient food and disregard of the calls of Nature led to excessive formation in the intestines of poisonous ptomaines and leucomaines, which destroyed the red blood-corpuscles. But before long it was proved that no ptomaines are produced in the intestines in constipation and that hæmolysis does not occur in chlorosis. Bunge[2] then suggested that the easily assimilated iron of the food is converted into unabsorbable sulphides by sulphuretted hydrogen and alkaline sulphides, which he thought were present in excess in the intestines in constipation. He explained the beneficial effect of inorganic iron salts in chlorosis by supposing that they combined with the sulphuretted hydrogen and so spared the organic iron, which could then be absorbed. This theory is also untenable, as there is little or no increase in the sulphuretted hydrogen in the intestines in constipation; moreover ferrous sulphide is quite efficacious in the treatment of chlorosis, and manganese salts, which combine with sulphuretted hydrogen as readily as iron salts, are useless.

It is now generally recognized that constipation is a result and not the cause of chlorosis, as it is cured when the chlorosis is effectively treated, whereas the reverse is not the case. There is no doubt, however, that constipation aggravates many of the symptoms of chlorosis, probably by auto-intoxication, and that the improvement which results from treatment with iron and arsenic is hastened by the administration of purgatives and the use of an appropriate diet.

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[1] Sir A. Clark: *Lancet*, 1887, ii, 1003.

[2] G. Bunge: *Lehrb. d. physiol. u. pathol. Chemie*, p. 94, third edition. Leipzig, 1894.

CHAPTER XIII

CUTANEOUS DISORDERS

Numerous diseases of the skin have at different times been supposed to result from constipation. Beyond the fact that a few of them may be associated with indigestion or food poisoning, both of which are often benefited by a purge, there is no foundation for this belief.

Pigmentation of the skin, especially round the eyes and in the situations where pigmentation is normally present, is, however, undoubtedly an occasional result of severe chronic constipation, as it rapidly disappears when the bowels become regular ; it can only be explained as a result of auto-intoxication (Lane).

CHAPTER XIV

FÆCAL TUMOURS

When for a prolonged period more fæces are formed than evacuated, a gradual accumulation occurs in the intestine. The accumulation begins in the pelvic colon or rectum, according as to whether the rectum is or is not still able to empty itself completely. In many cases the accumulation is confined to the rectum and pelvic colon or to the pelvic colon alone, these parts becoming enormously distended. Sometimes, however, when the pelvic colon is only moderately filled, no further dilatation occurs, but the retained fæces begin to collect in the iliac colon. The large intestine may thus become gradually filled from below, till in very rare cases the whole of it, from the rectum or pelvi-rectal flexure to the cæcum, is packed with fæces.

Less frequently an isolated mass of fæces collects in some part of the colon, the rest of which is comparatively empty. It may remain in the same position for months, in spite of free purgation, and yet produce no obstruction. In such cases the fæces are adherent to the mucous membrane on one side of the intestine only, or are lodged in a sacculus, so that part of the lumen remains free. In other cases the fæces may be in contact with the whole circumference of the mucous membrane, but the mass is tunnelled. Thus at the autopsy on a man, who had died from diarrhœa due to chronic dysentery, Hemmeter[1] found a small tortuous canal traversing a large mass of hard fæces, which distended the cæcum and the ascending and transverse colon ; through this the fluid stools must have passed.

Such fæcal accumulations are most frequently found in the rectum and pelvic colon, but they may occur in any other situation, such as the splenic flexure and the iliac colon, or very rarely in the cæcum and transverse colon. Occasionally two or more isolated masses of fæces may form in different parts of the colon.

A fæcal tumour in the iliac colon, pelvic colon or rectum can generally be recognized without much difficulty. A digital examination at once reveals the presence of fæces impacted in the rectum, and the sausage-shaped tumour formed by fæces in the pelvic colon and felt crossing the front of the upper part of the rectum is easily recognized. But the occurrence of a fæcal tumour in the cæcum, ascending colon or transverse colon is so rare that a mistaken diagnosis is more likely to be made.

The most characteristic sign of a fæcal tumour is afforded by the fact that it can generally be indented by firm pressure with the finger, and the depression produced remains after the finger is removed. When the tumour is in the pelvic colon the test can often be applied through the front wall of the rectum. In rare cases the fæces are so hard that they cannot be indented, and occasionally the sign cannot be elicited owing to the thickness or rigidity of the abdominal wall, or to the impossibility of fixing the tumour against a bony surface or between the fingers. When the diagnosis is still doubtful and the tumour has not disappeared in spite of the administration of enemata, the examination should be repeated under an anæsthetic.

The only other tumour which may give the same sign is a retro-uterine hæmatocele, which, if moderately large, not too tense, well shut off and mostly clotted, can, according to Hofmokl,[2] be indented in just the same way as a mass of fæces.

Gersuny[3] in 1896 described a sign for the recognition of fæcal tumours, which has been quoted by numerous recent writers. On pressing the abdominal wall over the most prominent part of a fæcal tumour with the finger slowly and firmly the fæces are indented, and on gradually diminishing the pressure the mucous membrane can be felt to draw away from the tumour. The sign is, however, only rarely present, as a number of conditions are essential for its occurrence. According to Gersuny himself, the mucous membrane must be moderately dry, the tumour not too hard to be indented, and gas must be present so as to cause the mucous membrane to separate from the fæcal mass. The value of the sign is thus small, as if the tumour can be indented, no further evidence is required to prove that it is fæcal. Moreover, as pointed out by Hofmokl, who invariably failed to find the sign in a considerable number of cases of fæcal tumours of various sizes, it is rare for any gas to be present in a part of the colon, which is filled with a hard fæcal tumour. In the cases in which I have looked for the sign, I have also failed to obtain it.

Even when the physical signs prove conclusively that a tumour is fæcal, it is necessary to ascertain whether there may not be an organic tumour of the colon in addition, the presence of which is obscured by the mass of fæces accumulated above the point where the intestinal lumen is obstructed. The presence of a growth can only be excluded with some measure of probability, if every trace of a tumour can be caused to disappear by treatment. Sometimes, however, an annular carcinomatous stricture forms such a small tumour that it is quite impalpable, and, on the other hand, considerable difficulty is often experienced in evacuating a hard mass of fæces, lodged in a sacculus of the colon or behind a fold of mucous membrane.

Fæcal tumours have often been mistaken for organic tumours of various organs. The following cases from the literature and from my own experience are quoted with the object of showing under what circumstances such difficulties in diagnosis may arise and how they may be overcome. Four of the cases are abstracted from Bright's 'Observations on Abdominal Tumours', in the fifth volume of the *Guy's Hospital Reports*, published in 1840, and Fig. 30 is a reproduction of one of his illustrations. He was the first to point out how closely a mass of fæces may simulate an organic tumour; 'they occasionally imitate,' he writes, 'in the most striking manner, enlargements of the liver and other organs, and appear to afford a decided and tangible evidence of disease such as few can withstand.'

The most common difficulty is to mistake a mass of fæces for a tumour of the iliac or pelvic colon and the rectum.

Obstructive symptoms produced by a fæcal tumour of the iliac colon.—Bright records the case of a young gentleman, convalescent from a severe attack of purpura, followed by pleuro-pneumonia, who was seized in the night with bilious vomiting, severe prostration and writhing pain in the abdomen. The pulse was frequent, the countenance sunk and pallid, and there was considerable abdominal tenderness. A distinct tumour was felt low down in the iliac region (Fig. 30, *d*), which suggested the presence of an organic obstruction. A poultice was applied over the left side of the abdomen, and two grains of calomel with half a grain of opium was ordered; a large injection of soap, dissolved in water, was thrown up. These remedies having been repeated two or three times, a large solid fæcal evacuation was procured. The tumour was found to have disappeared and all the symptoms subsided.

A fæcal mass in the pelvic colon can readily be mistaken for a growth. The mass felt on rectal examination in Case 24, in which symptoms of intestinal obstruction were present, was so hard that a mistake would very probably have been made had the patient been middle-aged instead of only eighteen. A rectal examination can always exclude a growth of the rectum, but when this has not been made a mistake may arise, as in the following case, recorded by Matthews Duncan[4]:—

Fæcal accumulation mistaken for inoperable growth of the rectum.—Matthews Duncan was asked to go to the country as a mere matter of form to see a lady, who was supposed to be dying from malignant disease of the rectum, the tumour being so large that it was palpable in the left iliac fossa. She had agonizing pain and tenesmus and was incessantly passing thin yellow fæces. He found that the tumour was a fæcal accumulation, which he dug out of the rectum with his finger, with the result that it completely disappeared and the patient was cured of all her symptoms.

An isolated mass of fæces in the transverse colon may be mistaken for a growth in elderly patients, and in infants it may occasionally simulate an intussusception, as in the following case :—

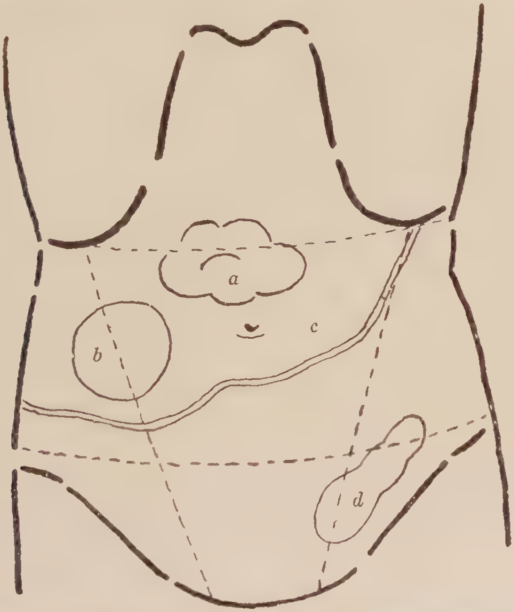

Fig. 30. Fæcal tumours observed by Bright. Reproduced from Vol. V of the *Guy's Hospital Reports*, by permission of the Editors.

Case 22. *Fæcal tumour simulating intussusception.*—Nellie R., aged 5, was admitted under me at 4 p.m. on February 23, 1908, as it was thought that she might have an intussusception. She woke up at 2 a.m. the same morning with abdominal pain. She vomited soon afterwards, and the pain and vomiting continued until she was admitted. Her bowels were opened three times during the day, the motions being semi-solid. Some bright red blood was passed with the last motion, but no blood or mucus had been passed independently of fæces. The pulse was rapid and feeble, but the temperature was normal. A sausage-shaped tumour was distinctly felt in the position of the transverse colon, rather more on the right side than on the left. The rectum was found to contain a good deal of soft fæces and a little blood. The passage of fæces on three occasions without blood and mucus and the presence of fæces in the rectum made it probable that the tumour, which felt just like an intussusception, was really fæcal. This proved to be the case, as it completely disappeared after a large evacuation had been procured by the administration of an enema.

On rare occasions a mass of fæces in the hepatic flexure or transverse colon may simulate an enlargement of the liver. Thus Bright's third case was an old gentleman, suffering from jaundice, anæmia and anorexia, in whom he found a distinct hardness extending from the margin of the ribs on the right side to below the umbilicus (Fig. 30, *c*). By means of purgatives an enormous mass of fæces was evacuated, and the swelling, which he thought was mainly fæcal, but partly due to hepatic engorgement, gradually disappeared; the jaundice and other symptoms were simultaneously relieved.

Bright also records a case where a definite diagnosis of cancer of the liver was erroneously made :—

Fæcal tumour simulating cancer of the liver.—A seafaring man, aged 55, was admitted into Guy's Hospital under Bright, with a hard, lobulated and painful tumour, situated midway between the ensiform cartilage and the umbilicus (Fig. 30, *a*). 'His complexion was sallow: his bowels stated to be freely opened. After careful examination, I had very little doubt that the tumour was organic, and connected with the left lobe of the liver; nor did the effect of remedies, or the appearance of the patient, at all undeceive me for some weeks; but I presently began to suspect that the pains, of which he made frequent complaint, were rather of a spasmodic character, and such as indicated some detention of fæces in the intestine. I therefore put him on a more decided plan of purging than at first, though the bowels had never been neglected. He now took repeated doses of compound extract of colocynth, galbanum pill, blue pill, and small quantities of muriate of morphia. The effect was, after a few days, to bring away a quantity of hardened balls of fæces ; and, in proportion, to diminish the supposed malignant tumour, till both pain and morbid growth, and every other symptom of disease, had disappeared.'

A mass of fæces lodged in the hepatic or splenic flexure may be mistaken for a kidney, as in the following case :—

Fæcal tumour mistaken for a movable left kidney.—A constipated woman, 30 years old, had abdominal pain, sickness and disturbance of the bowels for a week ; she was then found to have a hard rounded mass about two and a half inches in diameter in the upper part of the left side of the abdomen ; it was not tender and was movable within narrow limits. The urine was normal. Bristowe[5] diagnosed a movable kidney. A week later, the patient being now quite well, the tumour was found to have moved to the centre of the abdomen, immediately below the umbilicus. It was still movable in a restricted area, but it could not be restored to the region which it had formerly occupied. The diagnosis was accordingly altered, the tumour being now regarded as a mass of fæces, which had descended within the week from the descending colon into the sigmoid flexure. Three months later she was again seen by Bristowe, but in spite of the use of powerful purgatives and enemata the tumour had not disappeared ; it was now situated between the umbilicus and the left Poupart's ligament. It was larger than before, and was now sufficiently soft to be distinctly indented by the finger. The patient was not seen again.

In the rare cases, in which a mass of fæces in the rectum or pelvic colon forms a large tumour rising out of the pelvis and extending perhaps even to the level of the umbilicus, it can readily be mistaken for a pelvic tumour or a pregnant uterus. An erroneous diagnosis would certainly have been made by any one examining the tumour in the following case without having a knowledge of the history or of the congenital abnormalities present :—

Case 23. *Fæcal tumour in a girl with congenital abnormalities of her pelvic viscera.*—A girl, aged 16 years, passed her first motion three days after birth ; she became gradually more and more constipated, until, at the age of 8, a month or six weeks frequently elapsed before she opened her bowels. Sometimes after an unusually long period of constipation, fluid fæces would run away from her constantly for about a week. She had also occasional attacks of pain, but her colour and appetite were always good and her tongue clean. She was well developed and was accustomed to take plenty of exercise in the open air. Medical advice was never sought for her until December 15, 1907, when she was admitted into the Royal Surrey County Hospital, Guildford, under the care of Mr. H. B. Butler. Her temperature was 102° F. and her pulse was 120. Her tongue was furred and she looked ill. She complained of severe abdominal pain. The abdomen moved well on respiration, but it was very tender, especially over the right side. A hard, non-fluctuating tumour, dull on percussion, was found coming up from the pelvis; it resembled in size and position a uterus at the sixth month of pregnancy. On examination under an anæsthetic it was discovered that the patient had no anal canal, her rectum and vagina ending in a common cloaca. The rectum was found to be full of fæces and it appeared probable that the whole tumour was fæcal. A large quantity was removed by a blunt spoon, aperients and enemata. The temperature steadily fell and was normal on December 18. The tenderness had completely disappeared, but a tumour the size of a cricket-ball was still present in the right iliac fossa. The temperature rose on the evening of the 18th and fluctuated between 99° and 101° until the 26th, when the patient was again anæsthetized and an incision was made over the mass. Coils of intestine were found adherent to each other and to the parietal peritoneum, but the patient's condition did not warrant the long dissection which would have been necessary to penetrate between the intestinal loops in order to reach the tumour, so the incision was only packed with gauze. The pyrexia and pain now disappeared, and on February 2 the patient left the hospital apparently well, the wounds having healed and the tumour having disappeared.

On May 16 Mr. Butler was again called to see the patient, whose temperature was 102°. A painful swelling was found in the right iliac fossa. She was readmitted into the Royal Surrey County Hospital and an incision was made over the mass, which was found to be an intraperitoneal abscess. This was evacuated and the wound soon closed and the temperature fell to normal. On August 8 the abdominal tumour had reappeared, the bowels not having been opened since May 16; she was admitted into Guy's Hospital under my care. She looked the picture of health, was well nourished, with a good colour, healthy skin, moist clean tongue and good teeth. Her appetite was excellent. The lower part of her abdomen was completely filled with a very hard tumour, well defined above and laterally, rising out of the pelvis to a distance of seven inches above the pubes, its transverse diameter being eight inches. It was not fixed to the abdominal wall and could be displaced by manipulation as much as the crowded condition of the pelvis allowed. It was dull on percussion and could be pitted by prolonged pressure with the finger, the depression remaining for some time. The urine contained no albumin, pus or casts, and the circulatory, respiratory and nervous systems were quite normal. By means of a bismuth meal it was found that the cæcum and the ascending, transverse and descending colon were normal in size and position, except that the transverse colon was pushed upwards by the tumour. The fæces traversed the colon at the normal rate. The shadow ended about one and a half inches below the left iliac crest, where the iliac colon apparently joined the enormously distended pelvic colon and rectum, which together formed the sac filled with fæces. Fig. 31 shows somewhat diagrammatically the relation of the sac containing the fæces with the rest of the colon, as ascertained by the skiagraphic examination.

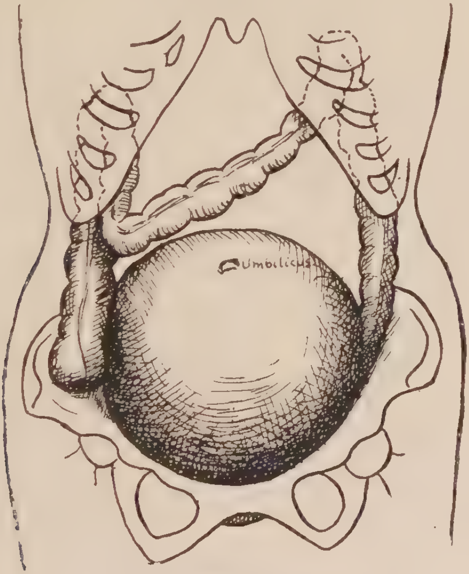

Fig. 31. Fæcal tumour.

On August 12 the patient was anæsthetized and placed in the lithotomy position. By means of two fingers inserted into the rectum and pressure exerted from outside on the tumour the fæcal mass was slowly dug away; subsequently a tube was introduced into the rectum and the irrigation, combined with the use of the finger, resulted in the removal of the whole accumulation. The colon was then irrigated until, two hours after the manipulations had begun, the water came away perfectly clear. By weighing the patient before and after the operation it was found that five pounds of fæces had been removed. The fæcal tumour having now disappeared, it was possible to investigate more accurately the nature of the congenital abnormality. There was no trace of an anus, anal canal or sphincter, the rectum opening into the posterior part of a cloaca. The opening had at first admitted one finger only, but it had been stretched until two fingers could be introduced into the rectum. The latter was separated by a transverse fibrous septum from two vaginæ, which were separated from each other by a median septum, which joined the transverse septum posteriorly. A cervix was found in both vaginæ, but only one uterus could be felt; the greater part of the latter was on the right of the middle line. Probably the septum between the vaginæ was continued into the uterus, the condition being that of 'uterus bilocularis'. The patient insisted on leaving the hospital within a week of the removal of the fæcal accumulation, so that there was no time to ascertain whether the treatment which had been instituted would be effective. Although her mother was instructed to give her enemata regularly, she failed to do so. It was, therefore, not surprising that the fæces began to reaccumulate in the rectal sac. When seen on October 24 a large fæcal tumour was again present in the abdomen, somewhat smaller than on the last occasion, and situated more in the left than in the right half of the lower part of the abdomen. In spite of the retention of fæces the patient looked and felt exceedingly well, and was able to walk twelve miles without fatigue. She was, however, much troubled by the continuous escape of small quantities of fluid fæces, apart from which she was unable to produce any evacuation.

The patient was readmitted into Guy's Hospital under the care of Mr. Arbuthnot Lane on October 30. On November 2 the fæcal accumulation was again removed under an anæsthetic, and the next day Mr. Lane excised the dilated lower end of the large intestine and made a colostomy in the iliac colon. The excised part was found to have contracted almost to its normal calibre; it was completely free from all adhesions and its mucous membrane was subsequently found to be quite normal. Adhesions were seen in the right iliac fossa; it appears probable that the abscess previously opened in this situation was appendicular in origin and quite independent of the fæcal tumour. The patient made an uninterrupted recovery and was discharged on November 27. At the end of June, 1909, she was perfectly well and very pleased with the result of the operation.

Apart from the remarkable size of the fæcal tumour and the interesting developmental abnormalities, the case is noteworthy as showing how in some cases prolonged retention of large quantities of fæces may occur without producing any anatomical or functional changes. There were no adhesions round the distended intestine; the musculature had not suffered greatly in spite of the long period during which it had been greatly stretched, as the gut was found at the operation to have contracted down almost to the normal size; and the mucous membrane was found to be perfectly healthy on both naked-eye and microscopical examination. Lastly, the patient at no period showed the smallest signs of auto-intoxication, her complexion being excellent, her nutrition good, and her mental and bodily activity quite normal.

In the following case a fæcal tumour was mistaken for a pregnant uterus both by the patient and her doctor.

Fæcal tumour mistaken for a pregnant uterus.—A woman, 25 years old, who had aborted several times, thought that she was pregnant on account of amenorrhœa and morning sickness. At her doctor's advice she lay on a sofa for six months in order to prevent another abortion. A round tumour rising out of the left side of the pelvis appeared and gradually increased in size till it reached the umbilicus. No vaginal examination was allowed. The patient gradually lost her appetite, became thinner and paler, and finally jaundice and œdema of the feet appeared. The bowels were opened on alternate days. Frerichs,[6] who was consulted on account of the jaundice, discovered that the liver was somewhat enlarged and that a transverse cylindrical tumour running through the epigastric region was present in addition to that rising out of the pelvis. Both tumours were found to have a doughy consistency, which led Frerichs to believe that they were fæcal. Enemata and senna were given with the result that an enormous amount of fæces was evacuated, and in eight days the tumour had disappeared and the jaundice greatly diminished. After three weeks in Marienbad the jaundice and hepatic enlargement had completely disappeared.

A number of cases have been recorded in which a fæcal tumour has been mistaken for tuberculous or malignant masses in the peritoneum. Thus Bright's second case was a man of 30, in whom a mass of fæces in the ascending colon was mistaken for a growth of the peritoneum (Fig. 30, *b*).

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[1] J. C. Hemmeter: *Diseases of the Intestines*, i, 375. Philadelphia, 1901.
[2] Hofmokl: *Wien. med. Woch.*, xlvi, 1848, 1896.
[3] R. Gersuny: *Wien. klin. Woch.*, ix, 889, 1896.
[4] J. Matthews Duncan: *Med. Times and Gaz.*, 1879, ii, 522.
[5] J. E. Bristowe: *Brit. Med. Journ.*, 1885, i, 1085.
[6] F. T. Frerichs: *Diseases of the Liver*, i, 68. Eng. Trans., 1860.

CHAPTER XV

FÆCAL OBSTRUCTION

A MASS of hard fæces not infrequently gives rise to symptoms of partial obstruction. Fæcal impaction was the cause of 69 out of 669 cases of intestinal obstruction in the London Hospital between 1892 and 1905; 32 of the cases were in men and 37 in women (Barnard[1]).

The most constant symptom of incomplete fæcal obstruction is colic. Bayliss and Starling showed that irritation of any part of the gut leads to contraction above and inhibition of movement below, this mechanism having the obvious purpose of removing the source of irritation. These excessive intestinal contractions are the cause of the colic which results from fæcal obstruction, the mass of hard fæces being the source of irritation. The colic may be sufficiently severe to cause profuse sweating and even syncope; it is invariably relieved by the passage of even a small quantity of fæces. It may last only a few minutes or continue with intermissions for weeks; it only disappears completely when the whole of the fæcal accumulation is removed. Occasionally no history of constipation is obtained, the patient's bowels having been opened daily. Such cases are due to cumulative constipation, each evacuation being insufficient and a fæcal tumour being sometimes palpable.

The colic is always aggravated by purgatives, and it is generally relieved by the local application of warmth and pressure and by opium and belladonna. Hence a purgative produces least pain and is most effective when administered in combination with opium or belladonna.

In severe cases of fæcal obstruction the intestinal gases may be unable to escape: the distension produced acts as an additional stimulus to the intestinal musculature, so that the colic is particularly severe. Thus two types of colic may occur in severe constipation,—one in which distension is present and considerable relief follows the passage of flatus, and the other in which no distension occurs and the escape of flatus produces comparatively little relief.

The spasmodic contraction of various lengths of intestine, leading to 'stiffening', which is often present in cases of organic obstruction (*vide* Case 12), does not appear to have been observed in cases of fæcal obstruction. It is also rare for the obstruction to be sufficiently severe to cause visible peristalsis. This was, however, observed in the following case:—

Case 24. *Intestinal obstruction with visible peristalsis, due to fæcal accumulation in the pelvic colon of a patient, whose bowels had been opened daily.*—Arthur V., aged 18, was admitted under me on April 16, 1908. He was in the habit of going to the closet before dinner and before tea every day, but as a rule his bowels were only opened at one of these visits, the stool being generally hard and somewhat scanty. On April 6 his bowels were opened once; on the 7th he felt a desire to defæcate before dinner, but on attempting to do so he was unsuccessful. He had some discomfort during the rest of the day, but on the subsequent days he felt quite well in spite of the fact that he was unable to open his bowels, though a small quantity of wind was occasionally passed. On April 12 he had an enema, but only a little discoloured fluid came away; a teaspoonful of rhubarb powder on the 7th, a pill on the 10th and a black draught on the 11th had had no effect.

On admission the patient did not look ill and complained of nothing but occasional colic. The abdomen was somewhat rigid and distended, especially on the left side. Well-marked peristaltic waves could be seen passing upwards on the right side, from right to left above the umbilicus and downwards on the left side. The rectum was found to be quite empty, but a stony-hard rounded mass, about three inches in diameter, was felt through the anterior rectal wall. Half a pint of olive oil was injected into the rectum in the evening, and retained during the night. An enema given the next morning brought away a very little fæcal matter, but the mass in front of the rectum could now be easily indented with the finger, proving that it was an accumulation of fæces in the pelvic colon. The oil injections were repeated each evening; the enemata given in the morning did not have much effect, so they were discontinued, and the patient succeeded in gradually expelling the now softened mass without further mechanical help. On April 25 the tumour had completely disappeared, peristalsis was no longer visible, and the abdomen had returned to its normal size.

It is rare for fæcal obstruction to be sufficiently complete to produce general symptoms of a serious nature; when these do occur, they are more like the symptoms which result from chronic than from acute intestinal obstruction due to organic lesions, as a considerable period of absolute constipation may elapse before death occurs. It is, however, exceedingly rare for fæcal obstruction to result in death. Thus Hilton Fagge[2] found that among the fifty-eight fatal cases of intestinal obstruction, which occurred at Guy's Hospital between 1854 and 1868, not one was due to impacted fæces, and only two out of the sixty-nine cases of fæcal obstruction collected by Barnard were fatal.

The following are two of the very small number of recorded cases of death resulting from constipation without organic obstruction :—

Fæcal obstruction, leading to symptoms mistaken for typhoid fever and resulting in death.—A previously healthy regimental doctor was supposed to have typhoid fever. Siebert,[3] however, could find no evidence of any disease except very severe constipation. The abdomen was distended and fæcal accumulations were felt in the descending colon and rectum. The patient's own doctor, still believing he had typhoid fever, refused to give purgatives and enemata. Some days later death occurred, after the distension had become enormous; hiccuping had been very troublesome and there was delirium at the end. At the autopsy nothing abnormal was found except an enormous accumulation of fæces in the whole of the large intestine from the cæcum to the rectum, which weighed eight pounds with its contents.

Fatal case of fæcal obstruction.[4]—A man, aged 28, had suffered from constipation since infancy. At the age of 17 he had a severe attack of obstruction, and a very large accumulation of fæces was removed from his rectum. After this aperients had no effect, and his bowels only acted with enemata, which he used every other day. He enjoyed 'tolerably good health', but was much troubled with flatulence. Six weeks before his death he was seized with vomiting and other symptoms of obstruction, and his rectum was found to be filled with fæces. These were removed and some relief occurred, but after a few days the abdomen again became enormously distended. The skin of the lower part of the abdomen and of the penis, scrotum and legs was œdematous. The liver and heart were displaced upwards; the pulse was 100 and feeble. The urine was scanty and concentrated and contained a trace of albumin. There was no vomiting. Friction, galvanism and aperients had no effect; enemata produced very scanty evacuations. He died unexpectedly the third day after his admission.

The organs of the body were healthy except the intestines. The lower end of the ileum was somewhat distended with fæces. The large intestine from the cæcum to the upper part of the rectum was enormously distended, its diameter measuring from six to eight inches. It was filled with fifteen quarts of semi-solid greenish fæces. The mucous membrane was extensively ulcerated, the largest number of ulcers being situated at the middle of the transverse colon and at the lower end of the sigmoid flexure. The distension ceased abruptly at the upper end of the rectum, but there was no obstruction. There was no evidence of past or present peritonitis.

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[1] H. L. Barnard: *Intestinal Obstruction*, in Allbutt and Rolleston's *System of Medicine*, iii, 743, second edition, 1907.

[2] Hilton Fagge: *Guy's Hosp. Reports*, xxviii, 462, 1869.

[3] A. Siebert: *Diagn. der Krankh. des Unterleibes*, p. 77. Erlangen, 1885.

[4] T. B. Peacock: *Trans. Path. Soc.*, xxiii, 104, 1872.

CHAPTER XVI

HIRSCHSPRUNG'S DISEASE ('CONGENITAL IDIOPATHIC DILATATION OF THE COLON')

A RARE but important complication of constipation is the condition commonly known in England and America as congenital idiopathic dilatation of the colon. This name is not at all satisfactory, as the condition is probably neither congenital nor idiopathic. Hirschsprung of Copenhagen, in a paper read at the Berlin Congress for Children's Diseases in 1886, laid the foundations of our present knowledge of the condition, so that it would be well to adopt the name of Hirschsprung's disease, by which it is known on the Continent.

In recent years a rapidly increasing literature on the subject has accumulated. Hale White[1] could only find records of twelve cases in 1897; Crozier Griffith[2] added twelve more in 1899, whereas Finney[3] collected 206 papers which had been published on Hirschsprung's disease up to January 1, 1908. It is, however, often exceedingly difficult to decide whether the condition present is really Hirschsprung's disease, and many of the 206 papers were probably written about cases of extreme fæcal retention and obstruction. Only cases, in which the constipation and distension date from infancy, should be called by this name, and the group of cases, described as occurring in late middle life, should undoubtedly be excluded.

The rarity of the disease is shown by the fact that there are records of only five cases occurring in Guy's Hospital, but three of these came under observation between September, 1907, and April, 1908. The disease occurs about eight times more frequently in boys than girls, but cases seen after the age of fifteen are equally distributed among males and females.

Symptoms.—There is always a history of constipation dating either from birth or from the first few months of life. At an early stage the bowels cease to act spontaneously, and drugs gradually lose their effect, until an evacuation can only be procured by means of enemata. Very rarely the bowels are opened daily, but the quantity passed is never sufficient, and large accumulations of fæces are always found in the distended intestine. The stools are generally soft or even semi-liquid, and at operations and after death the intestinal contents are found to be similar in character. In less severe cases, and especially in young children, scybala may be passed. In the late stages, if stercoral ulceration is present, attacks of diarrhœa may occur.

Soon after the onset of the constipation, the abdomen, which is generally normal at birth, begins to increase in size owing to distension of the colon with gas and fæces, the size varying from time to time, according to the frequency with which an evacuation is obtained. It gives a resonant note on percussion, but dull areas may be present over fæcal accumulations. The rectum is generally empty and ballooned, but its cavity is not directly continuous with that of the dilated colon. In rare cases, such as that recorded by Fenwick,[4] in which spasm of the anal sphincter was present, the dilated rectum forms part of the distended intestine.

Sooner or later an attack of complete obstruction occurs, no fæces being passed even for two or three months, though momentary relief sometimes follows the evacuation of small quantities of gas. The abdomen becomes enormously distended and tense; it is often painful and the pressure on the diaphragm may cause severe dyspnœa, cyanosis and palpitation. The outline of the distended colon is seen, and peristalsis is generally visible.

Albuminuria and œdema of the legs, penis and scrotum are sometimes observed. Vomiting may now occur, and the patient become exceedingly emaciated; death finally results from exhaustion or from general peritonitis, secondary to perforation of a stercoral ulcer, or from some intercurrent disease, especially of the lungs. An attack of complete obstruction is sometimes relieved by enemata or by the passage of a long rectal tube, which permits the escape of gas and fæces under high pressure, but similar attacks are very apt to recur.

Death may occur in the first year of life, but more frequently between the ages of three and eight. In a few cases adult life is reached, but there are no instances on record in which the age of thirty has been attained with the colon still dilated.

Case 25. Hirschsprung's disease in a woman of 22. Death after colectomy. Edith G., aged 22, was admitted under me on September 27, 1907. She had been constipated and had had a large abdomen as long as she could remember. Five years previously she had a more severe attack of constipation, which kept her in bed for a month, relief being finally obtained by means of enemata. For the few weeks before admission she had become steadily more constipated, and her abdomen more distended. She became dyspnœic and complained of abdominal pain, but she did not vomit. On admission she had been absolutely constipated for three days; her abdomen was tympanitic and enormously distended; the diaphragm was pushed up so far that the liver dulness extended from the third to the fifth space, and the heart dulness began in the first space. Some soft fæces were felt by rectum, and an enema was given with a copious result, but the distension was unaffected. A diagnosis of volvulus was made, and Mr. R. P. Rowlands operated. The other abdominal contents were completely hidden by the enormously distended colon, the muscular coat of which was greatly hypertrophied and the vessels much enlarged. The small intestine was normal. No volvulus was present, but the dilated pelvic colon was found to have folded over

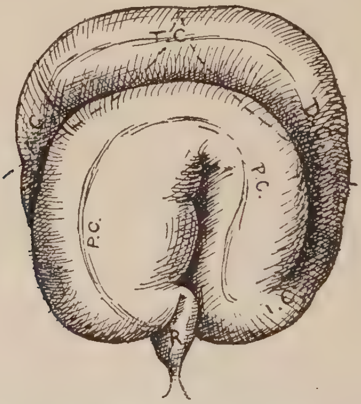

Fig. 32. Colon in case of Hirschsprung's disease. A.C., ascending colon; T.C., transverse colon; D.C., descending colon; P.C., loop of pelvic colon; R., rectum.

the undilated rectum, so that a kink was produced, as shown in Fig. 32. By pulling the pelvic colon upwards, it became possible to introduce a tube from the rectum into it, and a large quantity of gas and fluid fæces was evacuated. The gas re-accumulated very rapidly; a tube kept permanently in the rectum gave relief, but it was frequently blocked and the distension returned.

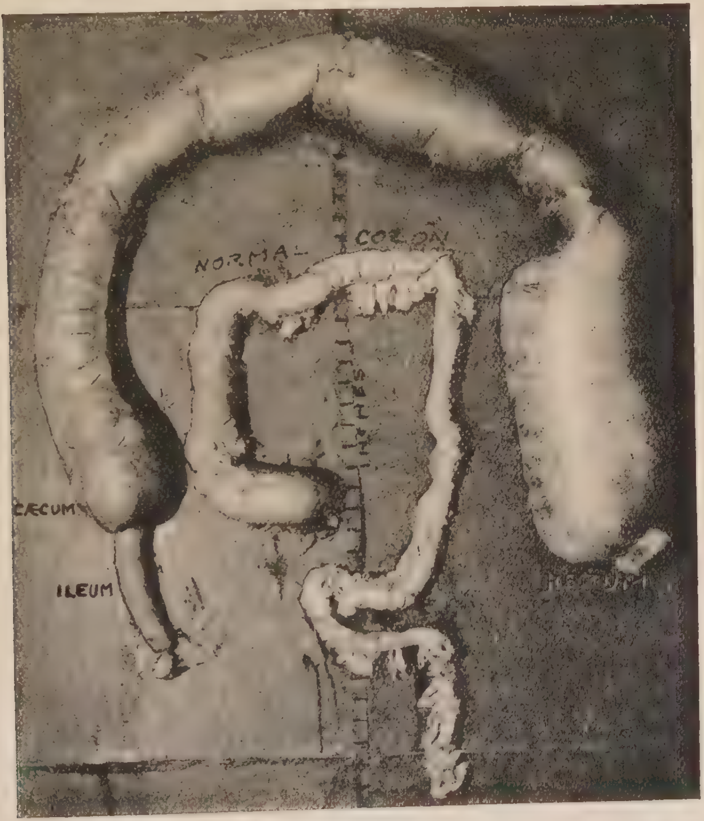

FIG. 33. Photograph of a normal colon and the colon from a case of Hirschsprung's disease.

As no improvement occurred in the patient's condition, it was decided after consultation with Dr. Newton Pitt to ask Mr. Rowlands to remove the dilated colon. The operation was performed on October 9, but the patient died from shock the following day. Fig. 33 is a photograph of the colon by the side of a normal colon.

Case 26. *Hirschsprung's disease in a boy of* 4, *cured by medical treatment.*—A boy, aged 4, was admitted under my care on April 23, 1908. He had always been very constipated and his abdomen prominent. During the last four months the constipation had become more severe and the distension greater, and he had occasionally vomited. On admission the abdomen was enormously distended : the circumference was 26½ inches, the distance from the umbilicus to the tip of the ensiform cartilage and to the pubes being respectively 6¾ and 4¾ inches. Strong peristalsis was visible, and distinct grooves were seen between the coils of intestine ; the abdomen was everywhere resonant. There was no pain and the boy was well nourished. On rectal examination a hard mass of fæces was found immediately above the anus. Dr. Hale White saw the case with me and agreed with my diagnosis of Hirschsprung's disease.

As enemata proved quite ineffective, the patient was anæsthetized on April 25, and the sphincter ani was dilated. An attempt to break up the mass of fæces present in the rectum proved unsuccessful, as it was accidentally pushed intact into the dilated colon. A large quantity of gas and fluid fæces immediately escaped ; by pushing the fæcal ball upwards most of the intestinal contents were squeezed out by pressure on the abdomen. When the distension of the abdomen had been greatly diminished, it was possible to fix the fæcal mass by the hand on the abdomen, and it was then broken up and removed by two fingers in the rectum. It was globular in shape, its diameter being 2¼ inches, and it weighed a quarter of a pound. It had clearly acted as a ball-valve, which occasionally allowed a little fluid fæces and gas to escape ; as soon as the patient strained, it was pushed into the opening of the anal canal, which it completely blocked. After its removal the colon was thoroughly irrigated. The mucous membrane of the lower part of the distended pelvic colon could then be felt *per rectum* and appeared to be quite normal. The circumference of the abdomen was now 21½ inches, and the distance from the umbilicus to the ensiform cartilage and pubes respectively 5¼ and 3 inches.

The next day hard fæces were again felt in the rectum and the colon was again irrigated. The patient was given liq. strychn. ♏ij every four hours, and a tight binder was fixed round the abdomen. His abdomen was massaged daily, and he was taught exercises to strengthen his stretched abdominal muscles. At first he required glycerine enemata in order to open his bowels, but after a week they were no longer required. When discharged on May 3, the abdomen was normal in size, the original measurements of 26½, 6¾ and 4¾ inches being reduced to 20½, 4½ and 3 inches respectively.

Pathological anatomy.—The lower limit of the dilatation is almost invariably situated in the last three inches of the pelvic colon. From this point upwards there is a rapid enlargement, the maximum diameter being generally three or four inches higher. In about one-third of the cases the enlargement is confined to the pelvic colon ; in the others varying lengths of intestine are dilated, but the dilatation is always greatest in the pelvic colon, and diminishes as it is traced towards the cæcum, the small intestine being always spared. The dilatation is often enormous, the greatest circumference of the gut being thirty inches in the case of the ‘ balloon-man ’, reported by Formad.[5]

The muscular layer of the dilated intestine is always hypertrophied, the thickness in some cases being a quarter of an inch. The hypertrophy is most marked in the circular fibres, but the layer of longitudinal fibres is always thickened and shows but little evidence of division into the normal bands, and the muscularis mucosæ is also hypertrophied (Finney). The mesocolon and the peritoneum covering the intestine are thickened, the former containing unusually large blood-vessels, lymphatics and lymphatic glands. The mucous membrane is always thickened from chronic inflammation and is often ulcerated.

Pathogenesis.—At least nine different theories have been advanced as to the pathogenesis of the disease, but only the most important will be discussed here. Most authors follow Hirschsprung in regarding the condition as a result of a congenital developmental abnormality. Marfan [6] believed that this was an excessive length of the pelvic colon, but there is no reason why this should give rise to dilatation and hypertrophy of the colon. In 1907 Hawkins [7] revived Formad's theory of a congenital neuro-muscular defect. But no abnormality was found in the nervous plexuses of the dilated colon in the only two cases, in which they have been minutely examined (Finney). Moreover, this theory does not account for the visible peristalsis and for the hypertrophy of the dilated intestine, as even complete division of all the nerves to the colon in animals does not markedly interfere with its motor activity.

Treves[8] observed a case, in which there was congenital narrowing of the rectum, and regarded the condition as always secondary to obstruction. Though his case cannot legitimately be considered an example of Hirschsprung's disease, which should be confined to cases in which no congenital stricture is demonstrable, the invariable presence of hypertrophy and the frequent observation of peristalsis in the dilated gut strongly support his suggestion. The hypertrophy can only be a result of increased work, which the intestine has to do in order to overcome some obstruction. Peristalsis occurring in a hypertrophied colon could not fail to evacuate it, if there were no obstruction to the passage of its contents into the undilated rectum.

The obstruction is, as a rule, primarily fæcal, though in rare instances it is spasmodic, as in Fenwick's case, which was secondary to an anal ulcer. This explains the fact that constipation almost always precedes the onset of dilatation. The first Guy's case,[9] a girl of seven months, who died soon after her admission under Dr. Habershon in 1875, and my own second case show how a small, but hard mass of fæces, impacted in the rectum or lower end of the pelvic colon of a child, can lead to extreme dilatation of the colon. As this condition is only rarely observed, it must give place at an early stage to obstruction of a different sort: the colon, when once dilated, as Perthes[10] was the first to point out and as was clearly demonstrated at the operation on my first case, produces a kink by overhanging the undilated part below (Fig. 32). The obstruction is thus maintained, even when the impacted fæces originally present have been evacuated. The absence of any obvious obstruction *post mortem* is easily explained, as there is no organic stricture, the obstruction being only demonstrable when the parts are in position. As laparotomy, by allowing the dilated colon to rise out of the abdominal wound, is often sufficient to relieve the obstruction for the moment, many surgeons have failed to demonstrate its existence at an exploratory operation. The valvular mechanism accounts for the fact that the intestinal contents can sometimes be passed through a tube, introduced into the dilated colon *per rectum*, whereas without the aid of a tube little or nothing is evacuated, in spite of the strong peristaltic contractions of the hypertrophied and dilated large intestine. At other times the kink prevents the passage of the tube until, during an abdominal exploration, it is abolished by pulling the dilated colon upwards. This explanation also accounts for the occasional instances in which the patient can empty his distended intestine by defæcating in some unusual position, such as when leaning over the back of a chair, as by this means the kink may be temporarily removed.

Treatment.—In early cases, such as my second, medical treatment can cure the condition. Any impacted fæces should be removed and the colon thoroughly emptied by repeated irrigation. Strychnine in large doses, abdominal massage, exercises and perhaps electricity are of value, as they help the emptied colon to regain its normal tone, and they strengthen the stretched abdominal muscles. But the most important point in the treatment is to keep the colon as far as possible free from distension with gas and fæces. If after the initial irrigations castor oil does not act, glycerine enemata should be tried, and if they fail, a rectal tube should be passed, through which flatus can escape and the bowel can be irrigated. If the distension rapidly returns, the tube should be kept continuously in position. When medical means do not produce sufficient relief, or it is found impossible to introduce a tube into the distended colon owing to the kink, a laparotomy should be performed. On pulling the distended colon upwards, a tube can be passed and the colon emptied ; the tube should be kept in position for some days. If the colon does not contract, an opening should be made in the most distended part of the colon ; the colostomy is occasionally sufficient to effect a cure. More frequently it is necessary, when the patient's condition has improved and the distension has somewhat diminished, to make an anastomosis between the end of the ileum, or the segment immediately above the most distended part of the colon, and the undistended rectum, the colostomy being kept open to act as a safety-valve. Finally it may be necessary to excise the whole of the dilated colon; the operative treatment has thus three stages, the shock of such a severe operation as colectomy in a very feeble patient being thereby avoided.

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[1] W. Hale White: *Diseases of the Colon*, in Allbutt's *Syst. of Med.*, i, 967, first edition. London, 1897.

[2] J. P. Crozier Griffith: *Amer. Journ. Med. Sciences*, cxviii, 283, 1899.

[3] J. M. T. Finney: *Surgery, Gynæcology, and Obstetrics*, vi, 624, 1908.

[4] W. S. Fenwick: *Brit. Med. Journ.*, 1900, ii, 564.

[5] Formad: *Univ. Med. Mag.*, Philadelphia, iv, 625, 1892. Quoted by Finney, loc. cit.

[6] Marfan: *Rev. des Malad. de l'Enfance*, xiii, 153, 1895.

[7] H. G. Hawkins: *Brit. Med. Journ.*, 1907, i, 477.

[8] F. Treves: *Intestinal Obstruction*, p. 242. London, 1902.

[9] Described in detail by Thomas Bryant: *Harveian Lectures*, p. 18. 1884.

[10] G. Perthes: *Arch. f. Chir.*, lxxvii, 1, 1905.

CHAPTER XVII

CATARRHAL COLITIS

When fæcal masses are retained in the large intestine for a longer period than normal, they become dry and hard. Sometimes, as in Case 23, no injury to the mucous membrane results, but more often the mechanical and chemical irritation gives rise to catarrhal inflammation, which is most marked in the iliac and the pelvic colon, where fæcal accumulation is of most frequent occurrence in ordinary cases of constipation. In dyschezia catarrh is often present in the rectum, either alone or with the pelvic colon, the condition being then termed catarrhal proctitis: as this has distinctive symptoms, it will be described separately.

Catarrh of the mucous membrane may lead to atony of the muscular coat, which further increases the severity of the constipation: this is analogous to the atonic dilatation of the stomach, which may occur as a sequel to chronic gastritis. Chronic catarrhal colitis may lead to atrophy of the mucous membrane, which is sometimes accompanied by atrophic changes in the muscular coat (Nothnagel[1]).

In chronic catarrhal colitis due to constipation, the stools consist of hard scybala, more or less covered with mucus. Viscid lumps or strings of mucus are also sometimes passed, either with the fæces or alone. The mucus may be quite transparent, but in severer cases it is more or less opaque, owing to the presence of epithelial cells and to a less extent of leucocytes. Occasionally a small quantity of bright red blood is present, owing probably to small superficial erosions of the mucous membrane. Hard scybala are often palpable in the iliac colon, and occasionally in still higher parts of the large intestine.

The catarrh is frequently accompanied by a feeling of abdominal discomfort. This is generally a result of flatulence, due to the associated atony of the intestinal musculature, which leads to dilatation from retention of gas as well as fæces. Pain and tenderness are absent in uncomplicated cases. The various symptoms, which may be associated with constipation, are apt to be particularly prominent when catarrh is present. The mucus in the stools is an additional source of worry to neurotic and hypochondriacal patients, and when erosions of the mucous membrane occur, absorption of intestinal toxins is facilitated. Dyspeptic symptoms, especially anorexia and furring of the tongue, are often present.

Less frequently recurrent attacks of acute catarrhal colitis may result from constipation, all evidence of catarrh disappearing in the intervals.

Case 27. *Recurrent attacks of acute colitis, due to constipation.*—I recently saw a neurotic man of 25, who had had several attacks of acute colitis in the course of six months; each was brought on by comparatively slight constipation, and was relieved as soon as the bowels were thoroughly evacuated. During an attack, the tongue was thickly furred, an unpleasant odour emanated from the skin, and mucus was present in the very offensive stools, which, even when semi-fluid after the administration of a purgative, contained hard fæcal masses; pain and tenderness were present over the descending and iliac colon, and the patient was exceedingly depressed. In the intervals the bowels acted well, there was no mucus in the stools, pain and tenderness were completely absent, but the patient was unable to interest himself in anything but the condition of his bowels, and could scarcely be persuaded to leave his bed for fear of possible ill effects. A sigmoidoscopic examination in one of the intervals showed that the colon was quite normal. The patient, being at last convinced that nothing serious is the matter with him, is slowly but steadily improving.

In neurotic patients, in whom catarrh occurs as a complication of spastic constipation, muco-membranous colitis, which is described in a later chapter, may result.

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[1] H. Nothnagel: *Zeitsch. f. klin. Med.*, iv, 422, 1887.

CHAPTER XVIII

CATARRHAL AND ULCERATIVE PROCTITIS. SPURIOUS DIARRHŒA

The irritation produced by the fæces which accumulate in the rectum in dyschezia often gives rise to catarrhal proctitis. More or less of the pelvic colon is generally simultaneously involved, but as the symptoms depend upon the condition of the rectum, the name proctitis is usually applied.

Examination with the protoscope shows that the mucous membrane is swollen and red, and its surface is often partially covered with sticky mucus. It readily bleeds when touched, and occasionally submucous hæmorrhages are present; the lining epithelium may be shed, shallow stercoral ulcers of various sizes being produced. In long-standing cases the mucous membrane atrophies and looks shiny and dry. In the earlier stages the thick mucous membrane bulges into the open end of the speculum, the passage of which is therefore difficult, but when atrophy has occurred the instrument can be introduced with unusual ease. The two stages can be distinguished by the finger; in the former the mucous membrane feels swollen and œdematous, and in the latter it feels thin and smooth. In atrophic proctitis, when the rectum has been completely emptied, the condition known as 'ballooning' is observed, and the speculum reveals a smooth-walled cavity, on the walls of which the projecting valves of Houston look unusually prominent.

In mild cases of proctitis no symptoms are produced, and the only evidence of the catarrh is the presence in the stools of mucus, which may coat the fæcal masses or be passed independently of them. In severer cases the catarrh gives rise to hyperæsthesia of the rectal mucous membrane, the sensibility of which is diminished in uncomplicated cases of dyschezia. Owing to the hyperæsthesia, a desire to defæcate is almost constantly present, and the patient makes frequent efforts to do so. These are, however, either completely ineffective, or a small quantity of mucus, with or without small fragments of hard fæces, is passed. Little or no relief follows, as the whole of one day's evacuations does not nearly equal the bulk of one natural stool, so that the fæcal accumulation in the rectum is not materially diminished. The patient often describes his condition as diarrhœa, and, unless careful inquiries are made and the stools are examined, unsuitable treatment with astringents and opiates may be instituted.

Bright[1] was among the first to recognize this source of mistake. He was on one occasion 'summoned into the country, in consultation with an eminent surgeon and a general practitioner, to see a lady who had been in vain treated with astringents for looseness of the bowels. He asked to see the evacuations, whereupon a single hard pellet of fæcal matter was shown to him, and it was at once clear that a purge alone could give relief.'

In severer cases of proctitis due to dyschezia the resemblance to true diarrhœa may be closer. The secretion from the inflamed mucous membrane is more profuse and consists of serous fluid in addition to mucus. It appears to exert a solvent action on the superficial layer of the scybala, as it is stained brown and contains a small quantity of fæcal matter. Frequent very watery motions containing mucus are thus passed. Defæcation is often accompanied with much painful straining and sometimes with abdominal pain and nausea, and in many cases micturition is also frequent and painful. After an evacuation the patient rarely feels satisfied, as he still has a sensation that something is present in his rectum. The stools can be distinguished from those of true diarrhœa by the fact that many of them contain small fragments of hard fæces, and a definite diagnosis can always be arrived at by making a rectal examination, when an accumulation of fæces is felt. Moreover, there is generally a history of more or less severe constipation preceding the diarrhœa, which occurs in attacks rarely lasting more than a few days, constipation being invariably present in the intervals. When there is ulceration, bright red blood is generally present in the stools, and constitutional symptoms are often more marked than in cases of simple proctitis, owing to the greater severity of the local condition and the absorption of toxic material from the raw surface of the ulcers. Such cases may simulate primary ulcerative colitis, but the presence of hard fæces in the rectum and small hard scybala in the stools should prevent a mistake in diagnosis from being made.

In rare cases a stercoral ulcer of the rectum may perforate into the surrounding connective tissue, as in the following case, described by Wright and Sir Charles Ball[2] :—

Perforation of a stercoral ulcer of the rectum into the ischiorectal fossa.—A woman, aged 65, who stated that her bowels were quite regular, had an attack of what appeared to be inflamed piles, from which she had suffered before. The skin of the buttocks became red and tense, especially on the right side, and the vulva was swollen. She had retention of urine and, after a time, diarrhœa. Finally the skin on the right side of the anus gave way and a considerable quantity of fæces escaped. Rectal examination now showed that the entire lower bowel was blocked with fæces. By breaking up the mass and by copious enemata a 'bucketful' of fæces was evacuated. The right wall of the rectum, about one and a half inches from the anus, was found to have sloughed, leaving an opening as large as a half-crown piece. 'There was a considerable quantity of fæces in the areolar space external to the bowel, and pressure with the finger extruded lumps of hard fæces as big as walnuts through the large fistulous opening in the right buttock.' The constitutional symptoms were slight and the patient recovered, the fistulous track closing without surgical interference.

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[1] *Vide* C. H. Fagge and P. H. Pye-Smith: *Textbook of Medicine*, ii, 374, fourth edition, 1902.

[2] W. M. A. Wright: *Lancet*, 1885, i, 1036, and C. B. Ball: *Diseases of the Rectum and Anus*, p. 380. London, 1887.

CHAPTER XIX

DIVERTICULA OF THE COLON. PARIETAL COLITIS. PERICOLITIS

In 1893 Mayor of Geneva drew attention to the occasional association with constipation of a condition, in which the whole thickness of the wall of the lower part of the large intestine is inflamed. He termed it *perisigmoiditis* or *sigmoiditis*, according as to whether the peritoneum was involved or not. Since 1893 the comparative frequency of the disease has gradually become recognized. In rare instances it may be caused by an injury (D'Arcy Power[1]) or by foreign bodies (Bland-Sutton[2]), but in the vast majority of cases it is produced by constipation.

Recent investigations have demonstrated that inflammation of the wall of the iliac and pelvic colon is very often secondary to inflammation of the acquired diverticula, which Bristowe[3] and Habershon[4] had long before shown might result from constipation. In 1907 Mayor[5] published his latest views on sigmoiditis and perisigmoiditis in the light of his increased experience and of recent work on diverticula, and in 1908 the whole question of the pathology of 'acquired diverticula of the sigmoid flexure' was admirably discussed by Maxwell Telling,[6] who collected eighty-three cases from the literature and added twenty-four new ones.

As anatomists now describe the sigmoid flexure in two parts, the iliac colon and the pelvic colon, it is inadvisable to retain the names sigmoiditis and perisigmoiditis. Similar pathological changes are found occasionally in other parts of the colon; the terms *parietal colitis* (Caley[7]) and *peri-*

colitis are, therefore, the best substitutes. The addition of the word 'parietal' is necessary in order to indicate that the submucous tissue is involved as well as the mucous membrane. When the iliac colon is involved, the name *pericolitis sinistra* (Rolleston[8]) may be adopted.

As pericolitis is in many instances only a sequel to the formation of diverticula, and as there are no means of distinguishing clinically between cases which are due to this cause and those which are not, the pathogenesis of diverticula of the colon will be first considered.

Diverticula of the large intestine are certainly much more common than a study of most post-mortem records would suggest. This is due to the fact that the iliac and the pelvic colon, where they are most frequently situated, are not as a rule examined with sufficient care in autopsies on patients dying from diseases unconnected with the intestines. Even when they are the seat of pathological changes, the exact condition is easily overlooked, as very careful dissection is required for the isolation of the diverticula from the surrounding inflammatory tissues.

In nearly all cases in which a clinical history is obtainable, it is found that individuals with diverticula of the colon have suffered for many years from more or less severe constipation. The distribution of the diverticula corresponds with the position, in which accumulation of fæces most commonly occurs. Thus they are rarely found above the middle of the descending colon, and they increase in number and size as the lower end of the pelvic colon is approached. Although in dyschezia fæcal accumulation occurs first in the rectum, this is never the seat of diverticula, owing probably to the uniform thickness of its muscular coat.

The average age of eighty subjects with diverticula was sixty, the youngest being a constipated woman of twenty-two (Telling). Of eighty-one cases fifty-three were men and twenty-eight women. Diverticula are very rare before the age of forty, although very severe constipation is not uncommon among quite young people, and they occur much more frequently in men than in women, although, until old age approaches, the latter are more subject to constipation; hence other factors must be concerned in their production in addition to constipation. Chief among these are muscular atrophy and the presence of excessive fat in the walls of the colon. Owing to the atrophy of the muscular layer of the colon, which occurs in old age (p. 51), pressure from within produces diverticula more readily than in earlier life. The rare cases of diverticula in younger individuals may perhaps be associated with that form of constitutional constipation, which Nothnagel showed was due to a deficient development of the intestinal musculature (p. 49).

In a considerable proportion of the recorded cases, well-marked obesity was present, and in other cases the patients had been fat, but emaciation had occurred before death. In the obese there is an excessive development of the appendices epiploicæ and also of fat under the serous coat of the intestines. The presence of fat diminishes the resistance of the intestinal wall to pressure from within, so that diverticula are likely to occur, especially into the appendices epiploicæ. They are still more easily produced if an excessive development of fat has for any reason rapidly disappeared.

The blood-vessels of the colon are surrounded by a small quantity of lax connective tissue, where they pierce the intestinal wall. Consequently points of diminished resistance are produced, which, next to the appendices epiploicæ, form the most frequent site of diverticula.

In the majority of bodies, in which diverticula are found, a large number are present, generally arranged in two rows. They are often confined to the appendices epiploicæ, but sometimes a few or all may be situated close to the mesenteric attachment. Some are so small as to be barely visible to the naked eye, whilst others may attain a diameter of half an inch. They very rarely become larger, as secondary pathological changes interrupt their growth. The smallest are semi-globular in shape; the larger ones consist of fusiform pouches, the lumen of which communicates by very narrow necks with the lumen of the gut. In the walls of the smaller diverticula all the coats of the bowel are represented. As they grow larger the muscular layer gradually disappears, and the mucous membrane frequently becomes atrophied. The sharp division formerly made between true diverticula, in which all the coats are represented, and false diverticula, formed of the mucous membrane and peritoneum alone, is thus incorrect.

The diverticula are almost always filled with hard fæces. Owing to the deficiency in their muscular coat and their narrow neck, their contents cannot be expelled. On the other hand, there is a constant tendency for them to increase in size, owing to further quantities of fæces being squeezed into them from the lumen of the gut, whenever it is tightly packed with fæces.

Diverticula of the iliac and pelvic colon give rise to no symptoms unless pathological changes occur in them. Owing, however, to the stagnation of fæcal material within them, they are very liable to inflammation. Ulceration takes place, and, as a result of the thinness of their walls, their peritoneal covering becomes infected, so that parietal colitis and pericolitis are produced.

Pericolitis is not a very rare complication of constipation at a much earlier age than that at which diverticula are commonly found, so that it undoubtedly sometimes occurs without the previous production of diverticula. Hard fæcal masses retained in the iliac and pelvic colon often give rise, as already described, to catarrh of the mucous membrane. A greater degree of irritation leads to superficial necrosis of the mucous membrane with production of stercoral ulcers, and inflammatory infiltration of the submucous tissue occurs. The ulcers may be minute or very large, their extent bearing very little relation to the amount of fæcal accumulation. A raw surface being present, it is easy for toxins and septic organisms to invade the deeper tissues of the intestinal walls, a spreading parietal colitis being produced. In chronic cases there may be a general thickening of the colon with no evidence of pericolitis. More frequently, however, the inflammation extends to the peritoneum with the production of pericolitis.

Even in the absence of diverticula and of ulceration, it is possible that the whole thickness of the intestinal wall, including the peritoneum, may occasionally be infected from a fæcal accumulation.

Parietal colitis produces few symptoms until the peritoneum is involved. When in constipated individuals the iliac colon is somewhat tender and feels thickened, even after it has been emptied, parietal colitis is probably present. In a few cases the constipation is latent, fæcal retention occurring although the bowels are opened daily.

So long as no peritonitis develops, there is no pyrexia or rigidity. The stools may contain mucus and small quantities of blood, and there may be occasional attacks of spurious diarrhœa. Pain, especially on exertion and during defæcation, may now develop, and the patient often tries to diminish his pain by eating less, so that wasting occurs. A suspicion of cancer may therefore arise, but the iliac colon is in this stage more movable and less hard than when a growth is present.

When the peritoneum is involved, the colon becomes fixed and more tender, and the abdominal wall over the left iliac fossa rigid.

Case 28. *Pericolitis sinistra.*—A single woman, 33 years old, was admitted under my care in August, 1908, for pain in the left side of the abdomen. She had been constipated and had had similar attacks of pain since the age of 17. At times she had passed bright blood with her motions. Since December, 1907, the pain had been much more severe, and blood had been passed more frequently. The patient had, during the same period, become thinner and weaker.

On examination, cutaneous hyperæsthesia was found over the lower part of the abdomen on the left side, and there was extreme tenderness on deep palpation over the left iliac fossa. It was impossible to palpate the iliac colon on account of the great rigidity of the abdominal wall. The temperature was not raised. The patient was extremely constipated, and the motions contained a small quantity of blood and mucus. A diagnosis of *pericolitis sinistra* and stercoral ulceration due to constipation was made.

Six ounces of olive oil were injected every evening and retained during the night ; an injection of water was given in the morning. By this means the bowels were opened daily and the tenderness and pain gradually diminished, until it became possible to palpate the thickened, fixed and tender iliac colon. At the end of five weeks the pain and tenderness had disappeared, no more blood was passed, and the patient's bowels were generally opened without artificial assistance.

The irregular sausage-shaped tumour formed by the inflamed colon has been frequently mistaken for cancer, especially when symptoms of chronic or acute obstruction have been present. In very chronic cases the development of fibrous tissue has produced a tumour, which even during an operation or at the autopsy has been mistaken for a growth, until microscopical examination showed its inflammatory origin, or careful dissection revealed the presence of long and tortuous diverticula in the mass.

Pericolitis simulating cancer.—Moynihan[9] records the case of a man of 52, who had suffered from chronic constipation and had recently had two attacks of intestinal obstruction. On opening the abdomen, a mass was discovered in the sigmoid flexure, which was adherent to the small intestine and abdominal wall. The five inches of colon involved were excised, as cancer was diagnosed, but the thickening of the intestinal wall was subsequently found to be due to connective tissue, which had caused stenosis; numerous diverticula of the otherwise normal mucous membrane were found.

In other cases the tumour has been left as inoperable, but the subsequent complete recovery of the patient has revealed its true nature. A very long history of constipation and the complete absence of cachectic symptoms should arouse suspicions of parietal colitis; the sigmoidoscope should always be used in cases of doubt, as, although cancer of the iliac colon cannot be seen with it, inflammation and ulceration of the mucous membrane of the pelvic colon may be visible, if the tumour is due to colitis. Rosenheim[10] states that the spasm of the intestine, which temporarily prevents the complete introduction of the instrument, and the contrast between the inflamed mucous membrane of the pelvic colon and the normal rectum are characteristic signs of pericolitis sinistra.

On rare occasions a stercoral ulcer of the colon or of a diverticulum perforates. When adhesions to the bladder are already present, the perforation may occur into the bladder. Cripps[11] was the first to show that a vesico-colic fistula results much more frequently from inflammatory changes in the colon than from cancer; a case published by Sidney Jones[12] in 1859 showed that ulceration of diverticula might produce a vesico-colic fistula, and the investigations of Telling prove that this is probably its most common cause.

Vesico-colic fistula due to pericolitis, originating from inflammation of diverticula.—An example of this condition is seen in a specimen in the Guy's Hospital Museum (No. 945), taken from a man of 65, who had passed gas for twelve years and fæces for six weeks through the urethra. He died three days after a colotomy had been performed by Mr. Bryant. The sigmoid was found to be contracted and much thickened; the mucous membrane was normal but thrown into very deep folds, which hid the orifices of numerous diverticula, one of which burrowed through a large mass of inflammatory tissue, connecting the colon with the bladder, between which it formed a fistulous communication.

When perforation occurs into the peritoneal cavity, the symptoms are strikingly similar to those of appendicitis and its sequels, except that the left side instead of the right is chiefly involved. There is acute pain with pyrexia, absolute constipation and often vomiting; there is marked tenderness, muscular rigidity and often cutaneous hyperæsthesia over the left iliac fossa. The attack may slowly subside, after which the iliac colon can be felt to be considerably thickened, or a local abscess may develop, which may open again into the colon or into the general peritoneal cavity.

Intraperitoneal abscess, secondary to inflammation of diverticula of the colon.—There is a specimen in the Guy's Hospital Museum (No. 769), obtained from a man of 60, who had suffered from constipation and abdominal pain for ten years; six weeks before death an abscess formed in the left side of the abdomen. At the autopsy the abscess cavity was found to lie between the spleen, the left kidney and the colon, and to communicate with the sigmoid flexure: a number of tubular passages were found entering the appendices epiploicæ, and the inflammation of these appeared to have been the cause of the abscess.

In other cases, such as the following, general peritonitis is a direct sequel of the perforation:—

General peritonitis from perforation of a stercoral ulcer.—A man, aged 73, was admitted into St. Bartholomew's Hospital in a state of collapse. He had been constipated for many years, and his present illness began nine days before admission. A laparotomy showed that the peritoneal cavity contained free gas and fæces, which had escaped from a large rent in the sigmoid flexure. Death followed a few hours later. At the autopsy the cæcum and colon down to the sigmoid flexure were normal. The sigmoid flexure was so large that it reached the spleen and liver, to which it was connected by old adhesions. Its walls were hypertrophied and its inner surface showed several shallow ulcers, a number of which were perforated. The rectum was undilated and there was no trace of a stricture (Berry[13]).

Grawitz[14] believes that many of the non-malignant strictures of the colon, which have been ascribed to syphilis, gonorrhœa and other causes, really result from the cicatrization of stercoral ulcers. Though such a sequel of constipation is quite conceivable, the evidence brought forward by Grawitz is not very convincing. Nothnagel[15] suggested that annular carcinomata of the colon may develop from stercoral ulcers, just as cancer of the stomach may originate from a chronic gastric ulcer. Thus a history of prolonged constipation is often obtainable from patients with cancer of the colon, although this proves little, on account of the extreme frequency of the former condition. Stronger evidence is afforded by the fact that cancer of the small intestine is exceedingly rare, and in the large intestine it is much more frequent in the pelvic colon and rectum than anywhere else, these being also the situations, where hard fæcal accumulations and consequently stercoral ulcers occur with the greatest frequency. Surgeon-Colonel Pilcher tells me that cancer of the colon and rectum is rare among the natives of India, who are also remarkably free from constipation.

Cancer originating in an inflamed diverticulum.—Hochenegg[16] removed a growth from the middle part of the sigmoid flexure of a man of 70, who had been very constipated for many years. The growth appeared to have resulted from malignant changes occurring in an ulcer, which arose from the chronic irritation caused by retained fæces in one of the numerous diverticula which were present in the sigmoid flexure.

[1] D'Arcy Power: *Brit. Med. Journ.*, 1906, ii, 1071.

[2] J. Bland-Sutton: *Lancet*, 1903, ii, 1148.

[3] J. S. Bristowe: *Trans. Path. Soc.*, vi, 191, 1855.

[4] S. O. Habershon: *On Diseases of the Alimentary Canal*, p. 296. London, 1857.

[5] A. Mayor: *Arch. d. Mal. de l'Appar. dig.*, i, 576, 1907.

[6] W. H. Maxwell Telling: *Lancet*, 1908, i, 843 and 928.

[7] H. A. Caley: *Brit. Med. Journ.*, 1906, i, 1330.

[8] H. D. Rolleston: *Trans. Med. Soc.*, xxviii, 230, 1905.

[9] B. G. A. Moynihan: *Trans. Clin. Soc.*, xl, 38, 1907.

[10] Th. Rosenheim: *Deutsch. med. Woch.*, xxiii, 281, 1902.

[11] W. Harrison Cripps: *The Passage of Air and Fæces from the Urethra.* London, 1888.

[12] S. Jones: *Trans. Path. Soc.*, x, 131, 1859.

[13] James Berry: *Brit. Med. Journ.*, 1894, i, 301.

[14] E. Grawitz: *Deutsch. med. Woch.*, xvi, 651, 1890.

[15] H. Nothnagel: *Diseases of the Intestines*, p. 256. Eng. Trans., 1904.

[16] J. Hochenegg: *Verh. d. deuts. Gesellsch. f. Chir.*, xxxi, 402, 1902.

CHAPTER XX

APPENDICITIS. TYPHLITIS

Chronic constipation has been regarded as one of the most important causes of appendicitis, in spite of the fact that the latter, unlike the former, is more common in youth than in middle and old age and in men than in women. It has apparently been believed that in chronic constipation fæces accumulate in the cæcum and give rise to inflammation of its mucous membrane, which spreads to the appendix, or which, by blocking its orifice, gives rise to retention and infection of its secretion. But in recent years a change of opinion has occurred, and the majority of authorities now agree that a history of constipation is not more common among patients with appendicitis than among the general population, and that constipation plays no part in the pathogenesis of appendicitis. My X-ray observations on cases of constipation have shown that there is rarely any delay in the passage of fæces before the middle of the transverse colon is reached, and hard masses of fæces, which could alone give rise to stercoral inflammation and ulceration, are hardly ever present in the cæcum. Moreover, at the vast majority of operations for appendicitis the cæcum is found to be almost or completely empty.

If appendicitis were a sequel of stercoral typhlitis, some of the innumerable operations performed in the earliest stages of attacks of inflammation in the right iliac fossa would reveal the presence of the latter condition without appendicitis. But I have only found in the literature an account of five cases,* in which simple ulcerative typhlitis resulted from constipation, and in these cases, as in those of stercoral ulceration of the cæcum due to organic obstruction of the colon, it is remarkable that no appendicitis was present.

Fatal case of ulcerative typhlitis, due to constipation.—A man of 67, who had suffered for some months from symptoms of incomplete intestinal obstruction, died suddenly a short time after admission into the hospital. At the autopsy a stercoral ulcer was found on the posterior wall of the cæcum with a small perforation in its centre; the appendix was healthy. The cæcum and colon were distended with hard fæces, but no organic obstruction was found (Southam[1]).

The constipation, which generally accompanies the onset of acute appendicitis and which is present in many chronic cases, is not the cause but the result of the appendicitis. The latter, like inflammatory conditions of other abdominal viscera, gives rise to reflex inhibition of the intestinal movements, and so to constipation. Long-continued constipation may thus occasionally be due to chronic appendicitis, and it is in such cases that removal of the appendix may result in the cure of obstinate constipation.

* Four of these, reported by Nauwerk, Feltz, Willmanns and Reisinger, are abstracted in a paper by Franziska Cordes on Primary Perityphlitis: in the two new cases recorded by her,[2] the typhlitis was undoubtedly primary, but the evidence of its stercoral origin is quite inconclusive.

[1] F. A. Southam: *Brit. Med. Journ.*, 1895, i, 254.

[2] *Beitr. z. klin. Chir.*, lxiii, 742, 1909.

CHAPTER XXI

MUCO-MEMBRANOUS COLITIS*

NEUROTIC constipated individuals are liable to attacks of abdominal pain, accompanied by an increase in the constipation and by the passage of membranes, the condition being known as muco-membranous colitis. The first accurate clinical description of the disease was written in 1818 by Richard Powell[1] in a paper on 'Certain painful Affections of the Intestinal Canal'.

Muco-membranous colitis is much more common among the upper classes than among hospital patients, and it occurs four or five times more frequently in women than in men. It generally begins between the ages of twenty and forty-five, but it has on rare occasions been observed in children, even at such early ages as two (Boas[2]) and four (Dieulefoy[3]), and cases may exceptionally be met with even at the age of seventy (Hale White[4]).

Patients suffering from muco-membranous colitis are always neurotic, their abnormal mental condition dating from a period preceding the onset of the intestinal disorder. In many cases actual neurasthenia or hysteria is present, and all the patients tend to become depressed and hypochondriacal. During an attack the mental depression becomes more profound, and hysterical manifestations may occur in the predisposed.

A history of long-standing constipation is invariably obtainable. The constipation is largely nervous in origin, but it is often made worse by the insufficient quantity of stimulating food taken by the patient. It continues in the intervals, but is always most obstinate during the attacks. The constipation, apart from the attacks, is sometimes of the spastic variety, but more often it is not. No membranes are passed in the intervals, but occasionally small quantities of mucus accompany the fæces, showing that some catarrhal colitis is present.

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* The name *muco-membranous colitis* is adopted in preference to *mucous colitis*, because mucus is passed in excess in most cases of colitis, whether membranes are formed or not; in preference to *membranous colitis*, because there is a rare form of colitis, quite distinct from this in its etiology, pathology and course, in which fibrinous membranes are formed; in preference to *mucous colic*, because in many, if not in all cases, inflammation is present.

Attacks of muco-membranous colitis are often brought on by depressing emotions. They may occur at intervals of weeks or months, or may continue without intermission. The three cardinal symptoms of an attack are abdominal pain, constipation and the passage of membranes, although I have known the latter to be passed without pain.

During an attack a dull aching pain or simply discomfort is more or less constantly present. Paroxysms of colicky pain may occur at intervals; they are occasionally accompanied by nausea and vomiting, and may be severe enough to cause the patient to faint. The pain is situated most frequently in the left flank and iliac fossa and just above the pubes; at the same time the descending, the iliac and the pelvic colon are often tender and can be felt as a contracted cord, in which scybala can sometimes be distinguished. Less frequently there is pain and tenderness in the cæcum and ascending colon. The passage of fæces and membranes or of the latter alone, whether spontaneously or as the result of treatment, generally gives relief. In some cases, however, the discomfort is greatest for some hours after defæcation.

The constipation present in the intervals becomes much more severe during an attack. The stools consist of hard small scybala, which may be moulded into thin or flat pieces as in spastic constipation; in many cases they are peculiarly pale in colour and they may be very offensive. Defæcation is often accompanied by painful straining, and it generally leaves a sensation that something is still present in the rectum. On rare occasions a long period of constipation may be followed by spurious diarrhœa for several days, but stagnation of fæces in the colon is still present.

The mucus is frequently excreted as membranous shreds, but most typically it forms greyish cylindrical tubes, which are accurate casts of the colon. In extreme cases the casts may be two or more feet in length (Hutchinson,[5] Pye-Smith [6]); their diameter may be anything up to an inch and a half, and their walls may be exceedingly thin or as much as half an inch thick. They are often called skins by the patient and have been mistaken for tape-worms, but they are sometimes rolled into a ball, which can only be disentangled by washing in water. The mucus is transparent like ordinary mucus or opaque like fibrin, for which it was formerly mistaken; its colour is grey-white, but there is often some fæcal staining. Occasionally solid cylinders or unformed masses of viscid mucus are passed instead of membranes.

The membranes may be passed alone or with scybala, and tubular membranes may enclose fæces; I have also seen large membranes embedded in a mass of hard fæces. Occasionally streaks or clots of blood are present, owing to hæmorrhage from excoriations of the mucous membrane or from anal ulcers or hæmorrhoids, all of which may be produced by the long-standing constipation and the passage of hard scybala.

Sir Andrew Clark [7] was the first to prove that the membranes do not consist of fibrin, and subsequent investigations have shown that they are probably formed of coagulated mucin. The anomalous chemical behaviour of the membranes is due to the fact that the mucus is not merely dried or coagulated by acid, but has undergone a physical change, very similar to that which occurs in the coagulation of the blood.

Microscopical examination shows that the membranes, which are otherwise structureless, contain a number of cells, most of which are cylindrical and obviously derived from the epithelial lining of the intestinal mucous membrane. A varying but small number of leucocytes, chiefly eosinophile, are present. Charcot-Leyden crystals are often associated with the latter, from which they are probably derived, just as they are formed from the eosinophile leucocytes present in the Curschmann's spirals of asthmatic sputum. Isolated nuclei are found embedded in the mucus, and many of the bacteria, which normally inhabit the colon, are naturally also present.

There cannot be much difficulty in diagnosis if the stools are seen, but a lady, sent to me on account of abdominal pain and constipation, had passed membranes for ten years without ever mentioning the fact to her medical advisers. In some cases membranes are only discovered on examining the ejecta after irrigation of the colon. The attacks of pain may closely simulate appendicitis or biliary colic, but the passage of the membranes clears up the diagnosis.

Case 29. *Case of muco-membranous colitis, in which the enterospasm was demonstrated with the X-rays and the sigmoidoscope.*—A married lady, thirty years old, was seen with Dr. Mitchell of Guildford for abdominal pain, from which she had suffered with frequent short intermissions for ten years. The worry connected with three fatal illnesses in her family in the course of the last few months had recently much aggravated the condition. She lived a very active life, and when her mind was much occupied the pain was felt less. The discomfort was situated in various parts of the abdomen, especially on the right side, but recently it had been most frequent below the umbilicus. There had been more or less constipation throughout the illness, and the pain was always most severe after defæcation, which invariably felt as if it were incomplete. The replacement of a retroverted uterus produced considerable, but temporary, improvement. The abdominal muscles had been weak, but had recently been much strengthened by exercises.

Nothing abnormal was found on abdominal examination; the colon could not be palpated, owing to the thickness of the abdominal wall. On examining the rectum immediately before and after defæcation, it was found that marked dyschezia was present. As simple treatment produced very little improvement, the colon was washed out: a considerable quantity of membranes of various sizes was evacuated, together with numerous hard masses of fæces. The patient had never observed mucus or membranes in her stools before.

A sigmoidoscopic examination under an anæsthetic showed that the mucous membrane of the pelvic colon was slightly congested, a network of abnormally dilated vessels being clearly visible. Some shreds of brown mucus were seen adhering to the mucous membrane. Seven inches from the anus the sigmoidoscope met with considerable resistance, and the lumen of the colon was seen to be almost completely obliterated. Quite suddenly, after I had been unable to introduce the sigmoidoscope any further for some five or six minutes, it slipped in to its full extent, the hindrance to its introduction having clearly been a spasm, which had suddenly relaxed.

The patient was given a bismuth breakfast two days later at 9 a.m. At 1.15 p.m. the whole of the ascending colon and most of the transverse colon were visible (Fig. 34). As normally only the cæcum would have been visible by this time, it seemed probable that some obstruction, probably spasmodic in nature, must be present beyond the splenic flexure. A skiagraphic examination made four hours later showed that this was indeed the case. The whole of the descending and the iliac colon were now clearly visible as a very fine cord, thinner than any shadow of the colon I have ever seen: they formed a striking contrast with the ascending and transverse colon, the lumen of which was normal. Thus both the sigmoidoscope and the X-rays demonstrated the spasmodic nature of the condition, and the former also showed that a mild degree of true colitis was present.

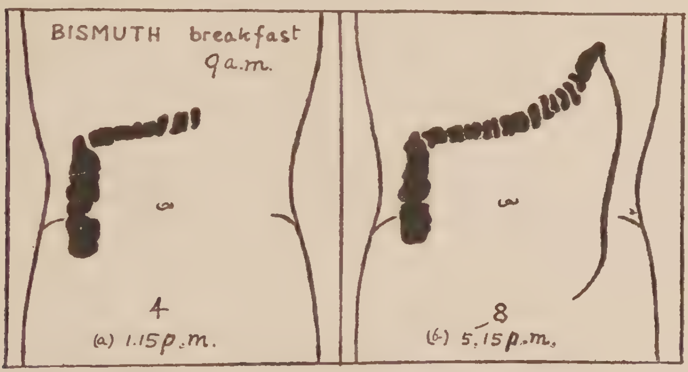

Fig. 34. Constipation with muco-membranous colitis.

The X-ray examinations further proved that no visceroptosis was present, the greater curvature of the stomach and the transverse colon both being unusually high, when examined in the vertical as well as in the horizontal position. On deep respiration the cæcum was seen to be freely movable, so that no adhesions from chronic appendicitis could be present.

The indications for treatment were obvious from the sigmoidoscopic and skiagraphic investigations. Purgatives would have hastened the passage of fæces through the small intestine and colon as far as the splenic flexure, although this was already abnormally rapid : they would also have increased the spasm of the descending, iliac and pelvic colon and so would have aggravated the pain and the obstruction to the passage of fæces. An appendicostomy would clearly have been quite useless, as the parts affected were more accessible to injections through the anus than through the appendix.

High enemata of the colon with plain water at 100° F. were given every morning under low pressure from a douche-can, immediately after the bowels had been opened without artificial assistance. By this means the accumulation of fæces and mucus was prevented, and the exciting cause of the spasm and the excessive secretion of mucus was removed. Half a grain each of codeine and extract of belladonna were given three times a day to diminish the spasm, and warm applications to the abdomen were ordered when the pain was severe. The patient was given an ordinary mixed diet, containing plenty of fruit and vegetables, and was advised to keep as quiet as possible, whenever the pain recurred. With this treatment the patient's condition steadily improved, and in two months she was feeling quite well and the stools were normal, but sufficient time has not yet elapsed to judge whether recovery will be permanent.

Associated conditions.—Muco-membranous colitis is occasionally secondary to the constipation which results from cancer of the intestine ; it is, therefore, important to make an examination of the rectum and pelvic colon by the sigmoidoscope in all cases, in which it is possible that cancer may be present.

The frequency of the association of appendicitis with muco-membranous colitis has been much exaggerated. This is shown by the statistics of Reclus, Bottentuit and Dieulefoy, brought forward by the latter in the discussions on appendicitis at the Paris Académie de Médecine, in 1897, which showed that no single case of appendicitis occurred among 640 patients suffering from muco-membranous colitis.

Pain in the right iliac fossa is certainly a frequent occurrence in muco-membranous colitis, but in the majority of instances this is not due to appendicitis, but to colitis affecting the cæcum and ascending colon. Some of the cases, in which the appendix is found to be normal after its removal for symptoms pointing to the occurrence of appendicitis, eventually prove to be muco-membranous colitis, the appendicectomy having produced no improvement. Thus sixteen of Langenhagen's [8] 1,200 patients with muco-membranous colitis had had their appendix removed, but relief had followed the operation in only two cases. In very rare instances chronic or recurrent appendicitis, by producing constipation, may give rise in predisposed individuals to muco-membranous colitis, which may then be cured by appendicectomy.

Nearly one-half of the women who suffer from muco-membranous colitis have also some pelvic disease, such as uterine displacements, pelvic cellulitis, endometritis or dysmenorrhœa. The association is due to the constipation, which results from the reflex inhibition of intestinal movements and which gives rise to the muco-membranous colitis.

Visceroptosis, including movable kidney, is frequently present with muco-membranous colitis. The association is not a result, as Glénard believes, of the displacement of the colon, but is due to the fact that the weakness of the abdominal muscles, which permit the viscera to drop, is a common cause of dyschezia.

Patients with muco-membranous colitis are frequently dyspeptic. There is often dilatation as well as ptosis of the stomach, this being due, like the constipation, to the depressed condition of the neuro-muscular mechanism of the alimentary canal, which often results from neurasthenia. Very little is eaten on account of the poor appetite and because the patients avoid various articles of food, which they believe disagree with them. Hence they are pale and thin and sometimes extremely emaciated.

The passage of *intestinal sand*, as Dieulefoy was the first to point out, is almost always associated with muco-membranous colitis, although on rare occasions it is accompanied by diarrhœa. It occurred in 9 per cent. of Langenhagen's 1,200 cases seen at Plombières. Its first appearance generally coincides with that of the membranes; occasionally it is only observed after the colitis has existed for several months or years, but it is probable that in many such cases its presence is at first overlooked. Only small quantities are generally passed, half an ounce being rarely exceeded. The gritty material resembles fine sand, and must be distinguished from the false intestinal sand formed of wood-cells, which is sometimes passed by individuals who have eaten a large quantity of pears and more rarely of bananas. True intestinal sand is composed of pale yellow or reddish-brown, opaque or translucent granules, very irregular in shape and never crystalline ; they contain about 30 per cent. organic material, which consists largely of bacteria ; the chief inorganic constituent is phosphate of lime. As intestinal sand is almost always associated with muco-membranous colitis, it occurs among neurotic and constipated individuals, and its passage is accompanied by severe colic. The mode of its production and its relation to muco-membranous colitis are quite unknown, but Cammidge[9] has recently made the important observation that the quantity of inorganic ash is increased in all cases of colitis, whether an obvious deposit of sand is present or not.

Prognosis.—Muco-membranous colitis is a very chronic disease, and cases have been recorded in which it has lasted for thirty years. If treatment is begun at an early stage, a cure can nearly always be obtained, but when the condition has been present for many years the outlook is very unfavourable, and even if improvement occurs the likelihood of a relapse is considerable. The disease does not in itself shorten life, but when severe and of long standing, it may cause a patient to become completely bed-ridden.

Pathogenesis.—There has been much discussion as to the pathogenesis of mucous colitis. As it is not a fatal disease, post-mortem evidence is scanty. A definite catarrh has been observed in a number of autopsies (M. Rothmann, Hemmeter, Boas, Einhorn, Schütz, Krysinski, v. Noorden, Trémolières), whilst in other cases the mucous membrane has been found to be perfectly normal (O. Rothmann, Hemmeter, Pye-Smith, Osler, Albu). Corresponding with these two series of pathological findings, Ewald[10] has observed two otherwise indistinguishable conditions with the sigmoidoscope.

In 90 per cent. of the forty cases examined, the instrument could be readily introduced twelve inches, and the mucous membrane was shiny and red and partially covered with a grey secretion, on the removal of which bleeding frequently occurred. In the remaining 10 per cent. contraction of the intestinal wall at first prevented the passage of the instrument more than five or six inches, even after insufflation. As a rule relaxation occurred after a short time, but in one case the spasm continued throughout the first examination, and the tube could only be fully inserted on a subsequent occasion. The mucous membrane looked dry and pale and there were no dilated vessels. Mucus, which could be readily removed without producing hæmorrhage, was sometimes seen between the folds. Intermediate cases may, however, occur, as I have myself observed with the sigmoidoscope (Case 29).

Nothnagel suggested that there are two different conditions, one inflammatory and one nervous, which he called respectively *enteritis membranacea* and *colica mucosa*. My own view is that mucous colic and mucous colitis are varieties of the same condition, and bear the same relation to each other that asthma does to asthma complicated with bronchitis. Two predisposing factors are invariably present—constipation and an abnormal nervous system. In the majority of cases the former is produced by the latter in the manner already described (p. 72). Retention of fæces in an individual, predisposed by an abnormally excitable nervous system, may result reflexly in local over-activity of the motor and secretory fibres of the colon. The supply of motor nerves to the intestines has already been described: Roger [11] has recently shown that stimulation of the vagus in rabbits also leads to the expulsion of mucous casts of the intestines. My X-ray observations have shown that serious delay in the passage of fæces rarely occurs before the hepatic flexure is reached, and in most cases it is confined to the part of the intestine beyond the splenic flexure: the seat of the spasm and of the production of excessive mucus probably corresponds with this, the small intestine being always exempt, and the more distal parts of the colon being more often affected than the proximal parts.

If over-activity of the motor fibres occurs alone, enterospasm results. This is analogous to the production of pure spasmodic asthma by irritation of the bronchial mucous membrane by some peculiar atmospheric condition in an individual with an abnormally excitable nervous system. In other cases the spasm is associated with increased secretion of mucus and ‘mucous colic’ results: this is analogous to the more common cases of asthma, in which the bronchial spasm is accompanied by excessive secretion of mucus. The spasm in both cases causes retention of mucus. Roger has demonstrated the existence in the intestinal mucous membrane of a ferment, mucinase, which is capable of coagulating mucin in about ten hours. The retention of the mucus in mucous colic is of sufficient duration for this action to take place, and consequently a membrane forms (‘muco-membranous colic’): the spasm in bronchial asthma causes the removal of the mucus to be so slow that the peculiar structures known as Curschmann's spirals form. In both muco-membranous colitis and asthma the expulsion of mucus is accompanied by relief of the symptoms. The irritation of retained fæces may result in the production of a true catarrh (‘muco-membranous colitis’), which is sometimes increased by injudicious treatment with irritating purgatives or injections. A mixed condition of catarrh and nervous over-action is then present, strictly analogous to the association of pure nervous asthma with bronchitis, produced by the action of the irritant primarily responsible for the asthma, or more frequently of the irritating fumes too often employed with the object of relieving the bronchial spasm.

The analogy between muco-membranous colitis and asthma is also seen in their etiology. A similar type of individual is liable to the two conditions, both of which may sometimes occur in the same patient either alternately or simultaneously (Fr. Müller, Hawkins), or in different members of a family. Attacks of both muco-membranous colitis and asthma may be brought on by emotional disturbances and by trifling changes in external conditions. The mucus excreted in the two conditions is very similar, if allowance is made for the great difference between the size of the lumen of the colon and the bronchioles. In both cases the few leucocytes embedded in the coagulated mucus are mainly eosinophile, and are accompanied by Charcot-Leyden crystals.

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[1] R. Powell: *Med. Trans. of College of Phys.*, vi, 106, 1820.

[2] I. Boas: *Diag. u. Ther. der Darmkrankheiten*, p. 243. Leipzig, 1901.

[3] Dieulefoy: *Bull. de l'Acad. de Méd.*, xxxvii, 287, 1897.

[4] W. Hale White: *Membranous Colitis*, in Allbutt and Rolleston's *Syst. of Med.*, iii, 816, second edition, 1908.

[5] J. Hutchinson: *Path. Soc. Trans.*, ix, 148, 1858.

[6] P. H. Pye-Smith: *Path. Soc. Trans.*, xlvii, 52, 1896.

[7] A. Clark: *Path. Soc. Trans.*, ix, 192, 1858.

[8] Langenhagen: *Muco-membranous Enterocolitis.* London, 1903.

[9] P. J. Cammidge: *Med. Chir. Trans.*, xc, 616, 1907.

[10] C. A. Ewald: *Ther. der Gegenw.*, xlviii, 365, 1907.

[11] G. H. Roger: *Alimentation et Digestion*, p. 453. Paris, 1907.

CHAPTER XXII

CHRONIC PELVIC MESENTERITIS. VOLVULUS

VIRCHOW[1] was the first to point out that volvulus of the pelvic colon—the most common variety of volvulus—is generally associated with abnormalities of the pelvic mesocolon (mesosigmoid), and Treves[2] in 1897 expressed his belief that chronic constipation was its most common cause. In elderly individuals, who are subject to constipation, the pelvic mesocolon sometimes becomes thick, opaque and stiff, and its vessels atrophy. At the same time it becomes greatly narrowed, especially at its origin, so that the ends of the pelvic colon come into close relation with each other. As no shortening occurs, the pelvic colon with its mesentery forms a fan-shaped loop on a narrow peduncle, round which it is very liable to rotate with the production of a volvulus.

The appearance of the pelvic mesocolon in these cases is very suggestive of chronic inflammation; the constant history of previous constipation, which results in stagnation of hard fæces in the pelvic colon more frequently than in any other situation, renders it probable that the pelvic mesenteritis is a result of constipation.

The peculiar nature of the contraction of the mesentery is probably due to the accumulation of fæces in the pelvic colon causing it to hang low in the pelvis, where it exerts a pull on the mesocolon, causing it to elongate at the same time as the secondary inflammation leads to a shortening in the transverse direction.

The change in the pelvic mesocolon causes some obstruction at the ends of the loop, especially the distal end, where the pelvic colon joins the rectum. The pelvic colon consequently becomes greatly distended with gas and fæces, and this further aggravates the condition. At the same time hypertrophy of the muscular coat and catarrh and occasionally ulceration of the mucous membrane occur. This first stage in the production of a volvulus has occasionally been observed during life, when an exploratory operation has been performed for the partial obstruction produced at the junction of the pelvic colon and rectum (Lane).

In some cases the loop twists on its pedicle to form a volvulus, and symptoms of complete obstruction occur. Acute intestinal obstruction, due to a volvulus of the pelvic colon, is thus almost always preceded by a long period of constipation, and there is often a history of attacks of partial obstruction.

The association of volvulus of the pelvic colon with chronic constipation is well seen in the following case, in which the volvulus developed whilst the patient was under treatment in hospital for constipation :—

Case 30. *Volvulus developing in a girl while under treatment for constipation : successful resection.* Maude O., aged 9, was admitted into Guy's Hospital on July 1, 1904, for constipation. Her bowels were first opened when she was three days old, after which a week elapsed before a second evacuation occurred. The constipation, which was thus present from birth, never disappeared. From the age of 5 until her admission she attended as an out-patient for constipation. When admitted, she suffered from abdominal pain, aching in the legs and insomnia. Her appetite was, however, good, and she looked well and had a good complexion. She was treated by exercises and abdominal massage, diet, castor oil and enemata, and improved considerably. At the end of October, however, she became more constipated again, and her abdomen became distended. On November 10 an oblique groove was visible, separating two enormously distended coils, in which peristalsis was clearly visible. By means of enemata the bowels were occasionally opened and the distension diminished. As the improvement was not maintained, Mr. Lane operated on November 24 and discovered a volvulus of the pelvic colon, which he resected. The patient was discharged on January 2, 1905, her bowels having been quite regular during the previous four weeks. The constipation, however, soon returned and the abdomen again became distended and painful. No treatment was of any use, and, as the patient was steadily losing ground, the greatly dilated colon was removed in January, 1909, but the patient died from exhaustion a few days later.

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[1] R. Virchow: *Virchow's Archiv*, v, 335, 1853.

[2] F. Treves: *Volvulus*, in Allbutt's *Syst. of Med.*, iii, 815, first edition. London, 1897.

PART IV

TREATMENT

CHAPTER I

PROPHYLAXIS. HYGIENE OF THE BOWELS

Neglect of the hygiene of the bowels is not only often the sole cause of dyschezia, but it is also an important factor in the majority of cases of constipation of every variety. When there is delay in the passage of fæces through the intestines, the resulting constipation is frequently aggravated by neglecting to make a proper effort to evacuate the dry fæces, collected in the bowel below the splenic flexure. Consequently this part of the intestine is never completely emptied, and an increasing degree of fæcal obstruction is produced, which materially increases the difficulty the intestine has in adequately performing its excretory functions. Hence instruction in the hygiene of the bowels—how to defæcate most efficiently—is the most important means of preventing constipation in children, and it is also an essential part of the treatment of the majority of constipated individuals of every age, whatever be the cause of their constipation. In some cases of slight constipation attention to the hygiene of the bowels may be all that is necessary in order to relieve the condition.

An attempt should be made every day at the same hour to open the bowels. In most cases the best time is immediately after breakfast, as under normal conditions most of the contents of the alimentary canal are then collected in the pelvic colon, and food taken into a completely empty stomach is such a powerful stimulus to intestinal activity, that some of the contents of the pelvic colon are propelled into the rectum, where they give rise to the ‘ call to defæcation ’. As described in the chapter on the physiology of defæcation, a number of subsidiary factors help to make the early morning the most suitable time for the daily action of the bowels. Among these are the muscular activity involved in getting up and dressing, in some people the cold bath and the glass of cold water drunk before breakfast, and in others the breakfast cup of coffee and the pipe or cigar, smoked immediately afterwards or during the act of defæcation. Even when the natural stimuli have produced no call to defæcation, the patient should make the attempt, as the increased intra-abdominal pressure produced by the voluntary contraction of the abdominal muscles and diaphragm may force fæces into the rectum, and so produce the desire to defæcate.

In addition to the daily attempt to defæcate at the same time, a call to defæcation felt at any other time in the day should be obeyed at once. If it is not obeyed, the desire rapidly passes away, although the fæces which gave rise to the sensation remain in the rectum. Hence its sensibility is impaired, and the first step is taken towards the loss of the defæcation reflex.

It is most important that sufficient time should be spent over the act of defæcation. It is rare that a single effort is sufficient to evacuate all the accumulated fæces. An individual should therefore not be satisfied with the result of the first effort, but should wait a short time and then make a second attempt to defæcate, so as to pass any fæces left behind after the first evacuation, and not infrequently the act must be repeated several times. On a number of occasions I have demonstrated this to patients by persuading them to wait patiently in the closet for a quarter of an hour, after which they have produced a copious evacuation, although a short time before they had made an unsuccessful, but too hurried, attempt to defæcate, and were therefore convinced that they would not be able to open their bowels during the whole day. Sometimes it is advisable to pay two visits to the closet at short intervals, perhaps before and after breakfast. A gentleman of sixty-three told me that he ascribed the perfect regularity of his bowels to a long-established habit of making two separate attempts to defæcate every morning. He passed a normal stool at 7.30 a.m., half an hour before breakfast, and then went to the City. On his arrival at 9.30 at his place of business, he at once retired to the closet, where he completed the evacuation of his bowels by passing a second smaller stool.

In order to prevent the temptation to hurry over defæcation, it is most important that the closet should be as comfortable as possible ; it should be clean, devoid of smell, well lit and airy, but properly warmed in winter. There should, moreover, be a proper number of closets in every house, as a single one is quite inadequate for a family of four or five individuals, particularly if several of them have to hurry away to business or to school immediately after breakfast. In institutions of various sorts, and especially in boarding-schools, the number of closets is frequently much too small. A photograph is reproduced in Kelly's *Medical Gynecology* of two dilapidated closets, which were the sole accommodation for twenty-two families living in a Baltimore slum : it is no wonder that constipation is common under such conditions. The hour of rising and of breakfast should be regulated, so as to allow sufficient time for the evacuation of the bowels to be efficiently carried out before the business of the day begins.

Children should be told how important it is to obey the calls of nature without delay, and schoolmasters and mistresses should realize the importance of encouraging them to do so. Much illness could be prevented, if all who had charge of children were as wise in these matters as a schoolmaster, whose practice is mentioned by Lauder Brunton. He sent all the boys in batches to the closets immediately after breakfast, each batch having to keep time to the minute ; if any boy failed to open his bowels he had to report himself for treatment. Dukes[1] suggests that some such notice as the following should be fixed inside the door of every water-closet at schools : '*A Maxim of Health.*—It is important that every boy should strive to obtain a daily action of the bowels. The only way to ensure this is to visit the W.C. every day *at the same hour*, the best time being immediately after breakfast.'

Many cases of chronic constipation, especially in women, originate through false modesty. It is important to impress upon girls that no feeling of shyness should prevent prompt obedience to the call to defæcation, at whatever inconvenient time it may occur.

If the patient cannot be persuaded to get up sufficiently early in the morning to enable him to devote a proper amount of time to defæcation, the habit should be cultivated of opening the bowels in the evening, although the physiological time for the act is undoubtedly the morning. The only other patients, who may advantageously defæcate in the evening, are those whose constipation is complicated by the presence of hæmorrhoids or a prolapse. Hæmorrhoids tend to become congested and prolapsed after defæcation, and rest in the recumbent position after they have been replaced is very beneficial.

It is remarkable that two of the best-known writers on constipation are in direct opposition to each other as to whether it is advisable to read in the water-closet: Birch [2] is in favour of reading a newspaper or other light literature during defæcation, whilst Illoway [3] is equally strong in his condemnation of the practice.

My own opinion is that reading may be harmful during one part and useful during another part of the act. As a rule a voluntary effort is required in order to initiate the defæcation reflex; all the individual's attention is required for this. When, however, the reflex act is set in motion, it is completed most efficiently if left to itself and not hurried by voluntary action, so that reading does no harm and may even be beneficial. A patient of Dubois' [4] said to him: 'When I try too hard I do not succeed; but when I put on my spectacles and read a newspaper it comes of itself.' After the first part of the stool is evacuated, time should be allowed for the peristalsis of the large intestine to carry the remaining fæces into the pelvic colon and thence into the rectum. This also is most efficiently carried out by the intestines when left to themselves, and too great attention directed to the act is more likely to inhibit than to accelerate this involuntary process. Hence, if it occurs at all slowly, it is quite right to occupy the mind by reading for a few minutes, until the desire to defæcate is again felt. Then the newspaper is once more discarded and the evacuation of the intestine is completed by a combination of voluntary and involuntary muscular activity.

In all cases of dyschezia, and in all cases in which the sluggish passage of the fæces through the intestines to the pelvic colon has caused them to become so hard and dry that a special effort is required in order to expel them completely, it is most important that a suitable position should be assumed for performing the act of defæcation. It has already been pointed out that the use of the high seat of the majority of water-closets interferes with the maximum efficiency of the voluntary part of defæcation, and that the squatting position assumed in uncivilized life is the most physiological. For this reason children should not be allowed to sit with their legs dangling during defæcation. In the first few years of life they should squat on a chamber-pot: this should not be too large, or defæcation may be rendered difficult by the buttocks being pressed together instead of being widely separated. When too old for a chamber, children should use the water-closet, but be provided with a high firm stool for their feet.

Adults, who are inclined to be constipated, especially if their abdominal muscles are weak, should also use as low a seat as possible, so that firm pressure can be exerted by the thighs on the abdominal wall. This is one of the most essential parts of the treatment of dyschezia. A height of about nine inches is best; when the seat is too high for a proper position to be assumed, a wooden footstool nine inches lower than the seat, or a bed-pan raised slightly above the floor, should be used.

Bed-ridden patients should, whenever possible, be allowed to sit erect on a bed-pan or, better still, be moved on to a commode placed at the side of the bed, as the constipation, from which they are likely to suffer for various reasons, is certain to be increased, if they are compelled to defæcate whilst lying down. When it is a matter of importance that the patient should exert himself as little as possible, the commode should be raised on a wooden platform of such a height that the seat is on a level with the bed, so that the patient can be moved on to it without any difficulty.

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[1] Clement Dukes: *Health at School*, p. 86, fourth edition. London, 1905.

[2] S. B. Birch: *Constipated Bowels*, p. 149. London, 1861.

[3] H. Illoway: *Constipation in Adults and Children*, p. 96. New York, 1897.

[4] P. Dubois: *The Psychic Treatment of Nervous Disorders*. Eng. Trans., p. 303, 1906.

CHAPTER II

PYSCHOTHERAPY

'The bowels were made for man, not man for his bowels' (Goodhart[1]).

Trousseau[2] in 1868 stated his conviction that when 'constipation is not constitutionally inherent in the individual, the will, patiently and regularly applied, will often triumph over the infirmity'. More recently, the psychical treatment of constipation has been strongly advocated by Dubois, Forel, Goodhart and Lyon.

Psychical treatment consists in the first place in the eradication of two ideas which inhibit intestinal action and defæcation. One of these is the conviction that constipation will inevitably result if no artificial means are taken to produce the regular action of the bowels, so that the habit is established of using purgatives or enemata, although they are not really required. Thus many individuals, whose bowels would act quite normally if left to themselves, have the fixed idea that a block or some other dangerous condition would immediately follow the omission of the customary pill or enema. In such cases, an attempt should be made to persuade the patient that his constipation is merely a faulty habit, which can be readily and completely overcome without recourse to purgatives or enemata, by attention to the simple measures described in the chapter on the hygiene of the bowels, and by some slight changes in diet.

Dubois[3] relates the case of a hypochondriacal old man, who for twenty years had taken an enema every day, and had never dared to do without one. Dubois pointed out to him the necessity of stopping enemata, which doubtless increased the rectal pain from which he suffered. At first he would not hear of it, and declared that a single day of constipation would be enough to plunge him into melancholy and lead him to suicide. After much persuasion, he consented to make the attempt to open his bowels before the enema was used ; he succeeded from the first day, and since then has had no more constipation. Several years afterwards he returned to Dubois very much agitated, because the Swiss were about to adopt the time of Central Europe, as he was afraid that this would upset all his habits !

The second idea which must be eradicated is that the attempt to defæcate will prove ineffectual. The patient is so frightened that he will not get his bowels opened, that, in the unco-ordinated efforts he makes to defæcate, he inhibits or disturbs the involuntary and reflex part of the act. In such cases the patient's fears should be allayed, and he should be instructed to make less violent efforts, and perhaps to divert his attention from the act by reading, so as to allow the reflex evacuation to occur without interference.

The majority of the milder cases of constipation can be cured by such means in a few days, but it is doubtful whether Lyon,[4] in his report of sixty-seven 'radical cures' out of sixty-nine cases, is correct in ascribing the good results to psychotherapy alone, for the establishment of regular habits and the routine use of all possible physiological stimuli to intestinal movements and to defæcation are essential parts of the treatment, which may therefore more properly be termed physiological than psychical.

Throughout the period of treatment the patient should be encouraged, and the most should be made of the least improvement. If he is disappointed at the slowness of his improvement, he should be reminded of his condition before the treatment was begun, so that he may realize that he is already a little better and can hope to obtain finally complete relief by steady perseverance. Constipation, which has been present for many years, can hardly be expected to disappear in a few days : weeks or months of treatment may be necessary.

Clement Dukes[5] strongly recommends a system of rewards as a substitute for drugs in the treatment of constipated children. He gives the following example of the good effects of this form of rational psychotherapeutics :—

> A boy, 12 years old, had required an almost daily aperient for two years in order to open his bowels. He was given no more medicine, but was promised sixpence, to be paid at once, every day he opened his bowels, but he was to forfeit a shilling every day he failed to do so. The first morning he earned his sixpence, but the second he lost a shilling. This was too much for him, and he never lost another, but gained his sixpence a day and made his fortune, without ever requiring another aperient.

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[1] J. F. Goodhart: *Lancet*, 1902, ii, 1244.

[2] A. Trousseau: *Clinical Medicine.* Eng. Trans., iv, 189, 1871.

[3] P. Dubois: *The Psychic Treatment of Nervous Disorders.* Eng. Trans., p. 291, 1906.

[4] J. P. Lyon: paper read before the Association of American Physicians; abstract in *Journ. Amer. Med. Assoc.*, 1908, i, 2020.

[5] Clement Dukes: *Health at School*, p. 85, fourth edition. London, 1905.

CHAPTER III

DIETETIC TREATMENT

Errors of diet are among the commonest of all the numerous causes of constipation, and frequently complete relief can be obtained by an alteration in the diet alone. Westphalen[1] in his private practice in St. Petersburg, where it is extremely common for insufficient vegetable food to be taken, cured 110 out of 121 consecutive cases of constipation by this means. Nearly all patients with constipation are benefited by a suitable diet, even if other treatment has to be simultaneously used. Thus in all cases in which the motor activity of the intestines is deficient, whether this is due to primary muscular defects or to deficient reflex action, or whenever the constipation is a result of the fæces being too dry, considerable improvement results from dietetic treatment. In mild degrees of dyschezia a change in diet is often of value, even when the motor activity of the intestines is normal, as it hastens the passage of the intestinal contents to the rectum, which they reach in a comparatively soft condition, so that the force required to expel them is diminished.

In the first place, it is of extreme importance that sufficient food should be taken, as constipation is often, especially in nervous patients, as much due to the insufficient quantity as to the unsuitable quality of the food. In some cases of neurasthenia and hysteria, associated with much wasting, forced feeding combined with isolation, as in the Weir Mitchell treatment, is often required in order to overcome the constipation.

It is important that the food should be eaten slowly and well chewed, as large lumps of undigested food set up irregular intestinal contractions and give rise to enterospasm instead of normal propulsive movements. For the same reason bad teeth should be filled or removed, and missing teeth should be replaced by artificial ones.

The principles, upon which a suitable dietary for constipation should be framed, can be readily gathered from a consideration of the normal stimuli to intestinal activity ; these have already been described in Part I and so only require to be briefly recapitulated in this chapter. The mechanical stimulation of the intestinal movements depends on the direct irritant action of cellulose and on the distension produced by the food ; the latter is mainly due to the indigestibility of cellulose, which also diminishes the digestion of vegetable proteins and starch, and so adds to the bulk of the intestinal contents. The intestinal juice and bacteria, both of which are increased by vegetable food, further increase the distension of the intestines. The chief chemical stimulants of intestinal activity are the sugars, organic acids and their salts, which are already present in vegetable food, and the products of bacterial decomposition of carbohydrates in the intestines ; the extractives and products of digestion and putrefaction of meat, and neutral fat, together with fatty acids, soaps and glycerine, produced by its digestion or bacterial decomposition, are importan , but less active stimulants.

Thus the main consideration in choosing a diet for constipation is to increase the quantity of vegetable foods, especially those which contain much cellulose, organic acids or sugar. If possible, the amount of fat in the diet should also be increased.

The table on p. 262 gives the amount of cellulose contained in different vegetable foods. The first column, which shows the percentage present in the undried food, is of more importance than the second column, which shows the percentage in the dried food, as it gives the relative amount of cellulose present in an equal bulk of the foods in the form in which they are commonly eaten.

One of the most valuable foods for constipation is whole-meal bread. A grain of wheat consists of the germ or embryo, which forms only 1½ per cent. of the whole, the kernel or endosperm, comprising 85 per cent. of the grain and forming the nutritive supply for the embryo, and the bran, which is the dense outer protective envelope of the grain. The whole grain contains 2·6 per cent. of cellulose, which is almost entirely confined to the bran, as this contains 18 per cent., whilst the germ contains only 1·8 per cent. and the endosperm 0·7 per cent. Hence white bread, which is made of the endosperm alone, and those varieties of brown bread, such as Hovis, which are made from the endosperm and germ, contain only about one-fifth of the cellulose present in whole-meal bread. It is clear, therefore, that the substitution of whole-meal bread for white bread is a very important part of the dietetic treatment of constipation. It is necessary to order specifically whole-meal bread, and not merely brown bread, as some forms of the latter contain no bran at all, and others contain only a small quantity.

Oatmeal contains double the quantity of cellulose present in whole-meal bread. Porridge, especially when it is prepared from the courser forms of oatmeal, and oat-cake are therefore excellent sources of cellulose. A soup-plateful of porridge contains about 65 grms. of oats and 2 grms. of cellulose.

All vegetables are of more or less value in the treatment of constipation. In the table they are arranged in series, Table to show the Amount of Cellulose in Vegetable Foods.*

	Percentage in the uncooked food.	*Percentage in the dried food.*
Wheat :		
Whole Grain	2·6	3
Bran	18	20
Germ	1·8	2
Endosperm	0·7	0·8
Bread :		
White Bread	0·3	0·5
Whole-meal Bread	1·5	3·0
Scotch Oatmeal	3·1	3·2
Edible part of Vegetables :		
Haricot Beans	4	5
Beetroot	3	29
Lentils	2	2·3
Asparagus and Onions	2	19
Parsnips and Artichokes	2	10
Turnips and Carrots	1·6	15
Vegetable Marrow	1·3	25
Cauliflower	1·2	13
Rhubarb and Mushrooms	1·1	19
Cabbage and Tomatoes	1·1	15
Broad Beans	1·0	1·1
Spinach, Seakale and Celery	0·9	15
Watercress	0·7	10
French Beans	0·6	6
Potatoes	0·6	3
Cucumber	0·5	13
Lettuce	0·5	8
Green Peas	0·5	2·5
Boiled Rice †	0·3	0·7
Fruit :		
Bilberries	12·2	48
Dried Walnuts	7·8	8
Raspberries	7·4	48
Dried Figs	7·3	9
Dried Dates	5·5	7
Currants (red, black, and white)	4·6	32
Plums	4·3	20
Greengages	4·1	36
Cherries	3·8	23
Peaches	3·4	31
Pears	3·1	20
Gooseberries	2·7	19
Apples	2·7	16
Grapes	2·5	22
Strawberries	2·2	19
Oranges	1·5	13
Melons	1·0	22
Bananas	0·2	0·8

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* Compiled from analyses quoted by Robert Hutchison: *Food and the Principles of Dietetics.* London, 1902.

† Semolina, tapioca and vermicelli contain even less cellulose than rice.

according to the percentage of cellulose they contain. The order shown is not, however, that of their relative value in the treatment of constipation, which depends to a great extent on the quantity of stimulating alkaline salts of organic acids which they contain. Thus haricot beans and lentils, though higher in the list than spinach and lettuce, contain much less chemical stimulants to intestinal activity. Taking into consideration both their mechanical and their chemical stimulating properties, the following vegetables are those which should be particularly recommended to constipated individuals: all green vegetables, especially spinach and cabbage; asparagus and onions; carrots, parsnips, turnips and artichokes; tomatoes, watercress and lettuce. One or other of these should be taken both at the midday and evening meals. Potatoes as ordinarily eaten, particularly if mashed, are of very little use, but they may be included in the diet with advantage, if they are baked and eaten with the skin. The latter is quite palatable when crisp, and the poisonous solanine it contains is destroyed by cooking.

The presence of sugar and organic acids in most kinds of fruit greatly enhances their value in the treatment of constipation, which would be small if it depended upon their cellulose alone. Thus oranges and melons, which contain very little cellulose, are often helpful, owing to the chemical stimulants they contain. On the other hand, bananas, which have less cellulose than any other vegetable food, contain very little organic acids and comparatively little sugar; they are indeed the only fruit, which can be regarded as quite useless in the treatment of constipation. Among the most suitable are dried figs, raisins, prunes, dates and ginger, which contain a large quantity of cellulose as well as sugar; fresh plums, greengages and peaches; raspberries, currants, gooseberries and strawberries; and pears, apples, grapes, oranges and melons, all of which depend more on their chemical than mechanical properties for their stimulating action. According to Crämer,[2] grapes and cherries produce considerable flatulence and should therefore be avoided; this is not, however, the experience of most people. Though bilberries contain considerably more cellulose than any other fruit, there is some doubt as to whether they should be recommended for constipation, as they are said to contain a good deal of tannin. I have not, however, been able to find upon what evidence this statement has been made. Nuts contain a considerable amount of cellulose, but the absence of chemical stimulants makes them less valuable in the treatment of constipation than many varieties of fruit, which are much poorer in cellulose. Some kind of uncooked fruit should be taken at breakfast, as well as at lunch and dinner, in all cases of habitual constipation.

Although cooking softens the cellulose of fruit to such an extent that its stimulating properties are considerably diminished, stewed fruit, especially prunes and figs and the combination of baked apples with raisins or prunes, is a valuable addition to the diet.

Jam and marmalade are useful constituents of the diet in constipation, as the addition of sugar adds to the stimulating effect of the fruit itself. Honey and treacle are of less value, as they contain no cellulose, so that the slight stimulating action they possess is entirely chemical.

It is generally less easy to increase the fat than the carbohydrates of a diet. But a considerable quantity of butter can be used in the preparation of all vegetables, and the value of lettuce, tomatoes, cucumbers and potatoes in constipation can be greatly increased when they are eaten as salad, prepared with oil and vinegar. Cream, taken with sweets of various kinds and in porridge, bacon fat and mayonnaise are also useful for those whose digestion is good.

Emaciated people, whose constipation is partly due to starvation, derive great benefit from cod-liver oil and the no less valuable olive oil, which are easily digestible and extremely nutritious, and lighten the work of the intestinal muscles by softening the stools. They are also of special value in cases of spastic constipation.

Although there are no solid foods which have a directly constipating action, it is advisable to prohibit certain articles of diet on account of their extreme digestibility, which deprives them of all mechanical stimulating properties, and is not compensated for by any stimulating action depending on their chemical constitution. Rice, tapioca, sago, semolina, vermicelli and macaroni contain only traces of cellulose, so that they are quite without effect on the intestinal movements. The same is true of fine white bread, blanc-mange and mashed potatoes. It is therefore advisable to replace these articles of diet by others of a more stimulating character. Thus stewed fruit with cream should replace rice and similar puddings, whole-meal bread should replace white bread, and green vegetables potatoes. In mild cases milk-puddings and blanc-mange need not be prohibited, but they should only be eaten with stewed fruit or with jam.

Although meat and eggs act very feebly as chemical and mechanical stimulants to peristalsis, there is no need to limit the amount taken, so long as this is not obviously excessive, as they alone can supply in a moderate bulk the quantity of protein required each day.

It is very important to see that sufficient fluid is drunk. In addition to that taken with or immediately after meals, a glass of cold water, which has a much more powerful effect on intestinal peristalsis than hot water, should be drunk while dressing in the morning before breakfast; another may be taken half an hour before dinner, and a third just before retiring to bed. Hard water has often been stated to be constipating, but it is scarcely conceivable that the minute quantity of lime it contains, amounting only to 0·002 per cent., can have any effect on the intestinal activity.

Milk has been supposed to exert a constipating action. It is, however, almost without influence on intestinal activity. As it is a food, it generally happens that when much of it is drunk, the quantity of solid food is diminished, so that the normal stimulation of the intestines may be deficient. If, therefore, for any reason a large quantity of milk is drunk, care should be taken that a sufficient quantity of vegetable food is eaten in addition. Sour milk, which has recently become a remarkably popular remedy for all manner of complaints, mainly as a result of Metchnikoff's belief that its constant use will lead to the prolongation of life, has a slight stimulating action on the bowels, owing to the lactic acid it contains. Its influence on the intestinal flora under certain conditions is indisputable, so that in cases of colitis associated with constipation, especially when the stools are unusually offensive, sour milk is sometimes very useful.

Alcohol has not itself any effect on intestinal activity. If, however, wine is habitually drunk instead of water, a considerable volume must be consumed in order to provide the requisite quantity of water. The sugar and acids of wine act as mild chemical stimulants of peristalsis, but in the case of red wines, especially port, this is more than outweighed by the harmful action of the tannin they contain. Hence a moderate quantity of white wine may be allowed, but claret and port are best avoided. Beer and cider, and to a less extent lemonade, have a slight stimulating action on the bowels, owing to their chemical constitution. This is shown by the fact that it is generally necessary to order aperients, when prohibiting beer to patients who have been drinking it in excess.

There is no doubt that tannin tends to produce constipation; the quantity and quality of the beverages which contain it must therefore be carefully supervised. In England it is very exceptional for excess of either coffee or cocoa to be drunk, so that it is here only necessary to refer to tea. As a rule China tea contains less tannin than either Indian or Ceylon, and it is therefore more suitable for constipated people. The method of preparation is of great importance, as the longer tea is infused the greater is the proportion of tannin it contains, a twenty minutes' infusion containing about double the amount present in a five minutes' infusion. Hence the boiling water should not be left in contact with the tea-leaves for more than four or five minutes, after which the infusion should be poured off into a second hot teapot: in China the tea is only infused for a few seconds. The addition of milk or cream has the advantage of rendering some of the tannin inert, as the latter combines with the caseinogen and lactalbumin. It is unnecessary, therefore, to forbid constipated people to drink tea, especially China tea, if it be prepared in the way described and drunk with cream or milk, so long as not more than two or three cups are taken a day. If cocoa or coffee, especially an after-dinner cup of black coffee, be drunk, a corresponding diminution is required in the amount of tea taken.

The diet must be modified when constipation is associated with certain other pathological conditions. With obese people the quantity of fat eaten should not be increased, but the substitution of food rich in cellulose for food poor in it is of great importance, for although less nutritive material is absorbed, the patient experiences no uncomfortable feeling of emptiness, as the bulk of the food is increased.

It is impossible to combine the dietetic treatment of constipation with that of diabetes. As the latter condition is, of course, the more important, it alone should be considered in the choice of the diet, and the constipation must be treated by drugs.

In the case of functional disorders of the stomach, the diet recommended does not require anything more than minor alterations. It may at first increase the dyspepsia, and it may sometimes lead to flatulence in people who were not before troubled with it. But, as a rule, this disappears as soon as the bowels begin to act regularly, so that it is unusual to find a patient, who cannot take the prescribed diet after a few small alterations have been made to suit individual peculiarities.

The ordinary dietetic treatment of a gastric ulcer generally results in constipation. I have found, however, that treatment by means of oil, which is theoretically the most rational and is practically very efficacious, is less frequently accompanied by disturbance in the action of the bowels. Oil is absolutely non-irritating; it inhibits the flow of gastric juice, and it has more than twice the heat value of an equal weight of even dried carbohydrate or protein. Although, of course, it cannot maintain nitrogenous equilibrium, I have found that patients may actually put on weight during the treatment, and it is rare to find an individual who cannot take pure olive oil, when it is given in proper quantities. The oil and the products of its digestion act as mild stimulants to intestinal activity, so that the bowels act regularly during the treatment, although only a very small proportion of the fat is lost in the fæces.

A non-irritating diet has generally been recommended for spastic constipation and muco-membranous colitis. It may indeed relieve pain, but it tends to aggravate the constipation, and at the same time to increase still further the malnutrition which is often present. On the other hand, von Noorden [3] recommends a very coarse diet, which is undoubtedly often valuable, but is too irritating for severe cases. The most satisfactory diet for the majority of patients is exactly the same as that given for other forms of constipation. The accumulation of fæces in the colon having been removed, by means which will be described later, retention of further quantities is prevented by the efficient stimulation of peristalsis afforded by this diet, so that the exciting cause of the spasm is removed. In exceptionally severe cases of spastic constipation and muco-membranous colitis, and in all cases of parietal colitis and pericolitis, it is advisable to begin the treatment with an absolutely unstimulating and completely digestible diet, such as arrowroot made with water, to which milk may later be added. Only after the colon has been completely emptied of the accumulated fæces and mucus and all pain has disappeared, should other articles of food be added, until finally the stimulating diet necessary for the treatment of the underlying constipation can be given.

[1] H. Westphalen: *Arch. f. Verdauungskrankh.*, vii, 28, 1901.

[2] F. Crämer: *Darmatonie*, p. 198. München, 1905.

[3] C. v. Noorden: *Membranous Catarrh of the Intestines.* Eng. Trans., 1903.

CHAPTER IV

DRUG TREATMENT

An idea of the enormous quantity of purgatives taken without medical advice can be gathered from the fact that the revenue derived in Great Britain from the stamp duty on patent medicines, a large proportion of which are purgative in action, was £43,692 in 1860 and reached the enormous sum of £327,105 in 1907. The majority of cases of constipation can be cured without drugs, if proper treatment is instituted at a sufficiently early stage, and the indiscriminate use of purgatives is productive of much harm. Moreover, in dyschezia purgatives are either absolutely useless, or they only have an effect when fluid stools are produced, a more or less considerable quantity of fluid and nutritive material being thereby wasted.

In mild cases of constipation, which require nothing more than increased attention to the hygiene of the bowels and perhaps some slight change in diet, the patient generally thinks the matter is of such slight importance that he treats himself with purgatives on his own initiative. But the constant irritation of the intestinal mucous membrane tends to diminish its excitability, so that it is frequently found that the dose required to produce an action must be steadily increased, and in some cases purgatives finally cease to act at all. It is only when increasing doses fail to produce a satisfactory result that the majority of patients seek medical advice, and then, the underlying condition being more advanced, treatment by simple hygienic measures and diet is less likely to be successful ; moreover, the diminished irritability of the mucous membrane not only causes drugs, but also the physiological stimulation of a suitable diet, to be comparatively ineffective.

Although the indiscriminate use of purgatives may have serious results, their dangers have been exaggerated by some authorities, who recommend that drugs should only be given as a last resource, when all other methods have failed. It is, however, very doubtful whether more harm is not done by the excessively irritating diet sometimes recommended than by properly regulated doses of aperients. The diet prescribed for constipation acts in much the same way as most purgatives—by stimulating the intestinal mucous membrane and producing a local reflex—but whereas the stimulus of the purgative is purely chemical, that of the diet is both chemical and mechanical. This is generally an advantage, but an excessive quantity of coarse, indigestible food probably does more damage than a mild chemical irritant to the mucous membrane, especially in the pelvic colon, where the innumerable hard particles of undigested vegetable matter present in the fæces remain in contact with the mucous membrane for a considerable time, and are very likely to give rise to a catarrh.

(*a*) **Indications for purgatives.** It is most unwise to give purgatives to every patient, who complains of constipation. The cause and nature of the constipation should first be ascertained, and drugs should only be given for certain definite indications, which will now be briefly discussed.

1. *Symptomatic constipation.*—When constipation occurs as a symptom of an acute illness, such as tonsillitis or pneumonia, an occasional purge is useful and does no harm, as with convalescence the normal condition of the bowels returns spontaneously. In incurable diseases, such as inoperable cancer, in which the expectation of life is short, constipation is also best treated by purgatives. In conditions, which are frequently accompanied by constipation and which are definitely harmed by it, such as chronic incurable diseases of the kidneys, insanity and diabetes, purgatives should be regularly given. When constipation is a symptom of a curable condition, such as chlorosis, upon which it exerts a directly injurious action, aperients should be ordered in the early stage of treatment in addition to the drugs and other therapeutic measures directed to the cure of the primary disease. Finally, purgatives are useful for making the stools soft, when defæcation is painful as a result of inflamed hæmorrhoids, anal ulcer or diseases of the pelvic organs.

2. *Constitutional and senile constipation.*—The regular use of purgatives for prolonged periods is most permissible in the cases which appear to depend on a congenital hypoplasia or an acquired atrophy of the intestinal musculature, the former being probably the cause of some cases of hereditary and so-called constitutional constipation, and the latter of senile constipation. Constipation coming on gradually after the age of sixty may at first be controlled by diet, but as a rule purgatives are finally required.

3. *Intractable constipation.*—In the comparatively small number of cases of constipation unassociated with dyschezia, in which non-medicinal treatment proves insufficient, purgatives must be used, but an effort should always be made to dispense with drugs at the earliest possible moment.

4. *Cumulative constipation.*—Many individuals, particularly if they lead a sedentary life and eat excessively, are in the habit of taking a purge once a week or at other regular intervals, although they may not be obviously constipated. The undoubted benefit they derive from this practice suggests that they are really suffering from cumulative constipation, although their bowels may be opened daily, and that the purging gets rid of the excess of fæces accumulated during the week. They would of course be in a more healthy condition and would no longer require their weekly purge, if they ate more wisely and took more exercise, but it is often impossible to persuade such individuals to make any radical alteration in their mode of life.

(*b*) **Choice and dosage of purgatives.**—Certain conditions must be fulfilled in the treatment of constipation by drugs, before the result can be regarded as satisfactory. The stool produced should be normal in size and consistency; that is to say, it should be formed of all the fæces accumulated beyond the splenic flexure at the time of defæcation, but it should not deprive the body of any water, salt or nutritive material, which ought to have been absorbed. A chlorotic patient was given cascara for her constipation in addition to iron and arsenic for her anæmia; although only one stool a day was passed, it was found with the X-rays that bismuth taken at breakfast reached the rectum in six and a half hours instead of the forty-eight hours required before treatment was begun. Food passing so rapidly through the intestines is not subjected for a sufficient period to the action of the digestive juices, and absorption must be deficient. Hence, though the constipation was relieved, the nutrition would have suffered if the dose of the aperient had not been reduced.

The dose of the purgative should be so regulated that one stool is passed every day and the desire to defæcate is felt immediately before or after breakfast and not at an inconvenient time, which would interrupt the day's occupations or disturb the night's rest. This is usually accomplished by giving a single dose of the drug in the evening or on rising, according to the rapidity of its action. But it is really more rational to divide the dose into three parts to be taken before or after meals ; the stimulating action of the purgative is equally effective, and, being spread through the whole day, it is less violent and therefore less liable to cause colic or catarrh. No pain should be present either before or during the act of defæcation, and the drug should be one which does not irritate the intestinal mucous membrane sufficiently to produce any inflammatory changes. It should exert no harmful action on the stomach, kidneys or other organs. Finally, if it is probable that the purgative will be required permanently, one should be chosen, which experience has shown can, in favourable cases, maintain its good effect without requiring any increase in the dosage.

From time to time attempts should be made to reduce the dose. When, on the other hand, the constipation does not improve and the drug begins to lose its effect, it is advisable to try some other drug before increasing the dose. It is often found that no addition to their doses is required, if two drugs are given alternately for periods of three or four weeks.

(*c*) **Pharmacology and indications of the principal drugs used for constipation.**—The mode of action and the indications for the employment of only a few of the most generally useful drugs among the enormous numbers, which have been recommended for constipation, will be described here.

1. *Alkaloids.* (i) *Strychnine.*—Strychnine increases the

reflex excitability of the peripheral as well as the central nervous system. The tone of the intestines, which probably depends to a great extent on the constant slight stimulation of Auerbach's plexus, the peripheral nerve-centre situated in the muscular coat, is therefore increased by strychnine. At the same time the increased excitability of Auerbach's plexus causes the action of a stimulating diet and of purgatives, which act by means of a peripheral reflex, to be more effective. Hence in those forms of constipation, which depend on depression of the central and peripheral nervous system, strychnine and nux vomica are of great value, whether given alone or in combination with vegetable or saline aperients.

(ii) *Atropine.*—Experiments on animals have shown that atropine paralyses the nerve-endings of the vagus and pelvic nerves in involuntary muscles. Hence, its action on the intestinal musculature is to diminish its tone and contractile force, and to regulate the intestinal movements, if they were previously irregular. It has long been known that atropine exerts a sedative action on intestinal colic, and my observations on Case 12 clearly showed the action of belladonna on both the tone and movements of the intestines. The lumen of the colon was found with the X-rays to be greatly increased after belladonna had been given, and the violent spasmodic contractions of various lengths of the intestines above the seat of obstruction were abolished, as shown by the disappearance of the colic and of the movements which had been previously seen on the screen.

Atropine is therefore of use in cases of spastic constipation and muco-membranous colitis, as it diminishes the excessive excitability of the peripheral nerve-centres and so permits orderly intestinal contractions to return. Trousseau[1] strongly recommended belladonna in the treatment of constipation, and ascribed its introduction for this condition to Bretonneau. When given alone in other forms of constipation, it is of little value, so that it is probable that the patients, who were relieved by it, were affected with spastic constipation.

The constipation associated with lead colic, being probably a result of irritation of the vagus, is sometimes relieved by the partial paralysis of the vagal nerve-endings produced by atropine: more frequently, however, atropine relieves the colic without opening the bowels. But when it is given with a purgative, such as magnesium sulphate or castor oil, which by itself generally increases the colic without producing a thorough aperient action, the bowels are well opened and no pain is produced.

Most vegetable purgatives give rise to more or less griping. This can often be entirely overcome by combining the drug with a small dose of belladonna.

(iii) *Opium. Morphia. Codeine.*—Opium is of value in those cases of constipation which are associated with pain, especially when it results from disease of the pelvic or abdominal viscera. The analgesic effect of opium and its paralysing action on the central nervous system, which leads to a diminution in the reflex activity of the inhibitory nerves to the intestines, may result in the bowels being opened. In spastic constipation opium is at first even more effective than atropine, but as the condition is often chronic or recurrent, it is advisable to employ it as little as possible.

Opium and its alkaloids should only be used in acute or incurable cases, as in chronic conditions the morphia habit may develop. Moreover, the initial good effects are generally replaced before long by the ordinary constipating action: this is less marked in the case of codeine than in that of opium or morphia, as it diminishes the intestinal secretions to a less extent.

Opium, morphia and codeine may therefore be used in acute painful conditions associated with constipation, such as biliary and renal colic, and in rapidly curable forms of intestinal colic, such as that due to lead poisoning. Especially in the latter condition they are most effective when given in combination with a saline purgative.

(iv) *Pilocarpine* and *physostigmine* directly stimulate the motor and secretory nerve-endings of the intestines, and to a less extent the muscle-fibres themselves. They therefore act as powerful purgatives, but only when given in a dose sufficient to produce unpleasant effects in other parts of the body. Physostigmine has, however, recently been recommended in cases of acute intestinal paralysis, both with and without peritonitis. It has the advantage of acting when injected subcutaneously, so that it can be given even when there is persistent vomiting: gr. $\frac{1}{100}$ of the salicylate should be used. It is, however, generally less likely to be effective than atropine injections or veronal given by mouth or rectum, as in the majority of such cases the paralysis is only apparent, the condition being really one of active inhibition, which must be overcome by sedatives (*vide* p. 83).

2. *Vegetable purgatives.*—Vegetable purgatives irritate the intestinal mucous membrane and thereby give rise to a local reflex in Auerbach's plexus, which results in increased motor activity. This diminishes the time during which absorption of fluids taken by mouth or passed into the alimentary canal can take place; there is no evidence to show that vegetable purgatives stimulate the secretion of the digestive juices. Those most commonly used do not irritate the stomach, as some, such as aloes, only act after they have become dissolved in the bile, and others, such as castor oil, after they have been split into active substances by the pancreatic ferments. Vegetable purgatives are generally supposed to act on both the small and large intestines; my X-ray observations show that this is true in the case of cascara sagrada, and Magnus,[2] in his experiments on cats, confirmed the belief with regard to castor oil, but found that senna acted on the large intestine only.

The investigations of Hiller[3] and of Kohlstock[4] show that the subcutaneous injection of vegetable purgatives produces considerable local pain, even when cocaine is added to the solution, and the result is so uncertain and there is so much danger of toxic effects on other organs, that it is inadvisable to employ this method of administration, even when a patient is vomiting or comatose. Under such circumstances the administration of certain purgatives by rectum may be tried, as described in the chapter on enemata.

(i) *Anthracene purgatives.*—Aloes, cascara sagrada, senna and rhubarb owe their purgative action to certain irritant compounds of anthracene. A considerable quantity of tannic acid is present in rhubarb, so that its aperient action is generally followed by constipation; for this reason it is not suitable for regular use in chronic cases.

(α) *Aloes*, the dried juice obtained from the cut leaves of various species of aloe, is perhaps the most frequently useful of all purgatives. It can in many cases be taken regularly for years without producing any bad result and without losing its efficacy; thus a friend of Lauder Brunton's had not found it necessary to increase the dose after forty years of continuous use. Aloes acts more slowly than any other aperient, requiring, as a rule, ten or twelve hours to produce a result. It is commonly supposed to irritate the rectum, but the evidence that it does so to any considerable extent is not very conclusive. It is, however, well to avoid using it when hæmorrhoids are present, and, unlike all other aperients, it may sometimes prove useful in very slight cases of dyschezia.

The action of aloes is said to be increased by the addition of iron salts; it is therefore often prescribed with a grain of ferrous sulphate. It is, however, not clear that the iron is really of value except in the constipation of chlorosis, when it acts upon the cause of the constipation. It has already been explained how the efficacy of vegetable purgatives can be increased by the addition of nux vomica and belladonna: one of the best pills for use in chronic constipation is composed of half a grain each of the extracts of nux vomica and belladonna, with one grain of Barbados aloes. This pill may be given three times a day, or, in mild cases, only after the evening meal: the exact dose should be carefully adjusted so as to produce a single formed stool each morning.

(β) *Cascara sagrada*, the dried bark of the Californian buckthorn, is, after aloes, the most valuable member of the anthracene group of purgatives. On account of its unpleasant bitter taste, the extract is best given as a pill or compressed tabloid. The addition of nux vomica and belladonna increases the value of the drug, the dose of which is about the same as that of aloes. When it is necessary for a purgative to be taken regularly for long periods, it is a good plan to give a cascara and an aloes pill alternately for a week at a time.

(γ) *Senna.*—Although the official preparations of senna are made from the leaves of cassia, the pods contain an equal quantity of the active principle—cathartic acid. Owing to its nauseous taste, it is often given in strongly flavoured preparations, such as the compound powder of liquorice and the confection of senna, which are mild laxatives particularly suitable for children. It tends to cause griping and nausea: according to Ebstein, this is due to a resinous constituent which is insoluble in water, so that an aqueous extract is the best preparation. Eight or ten senna pods should be left in four ounces of cold water in the evening, and the infusion drunk on rising in the morning; or some senna leaves contained in a muslin bag may, as Lauder Brunton has recommended, be stewed with some prunes without spoiling their flavour.

(ii) *Castor oil* is the oil expressed from the seeds of *Ricinus communis.* It is itself not an irritant and has no effect on the stomach. It is split by the steapsin of the pancreatic juice into glycerine and ricinoleic acid; the latter and its sodium salt irritate the intestines and cause purging, which is unaccompanied by any griping. Unless it is retained sufficiently long for bacterial decomposition to occur, it has no advantage over olive oil when given by rectum. The fatty acid and soap produced when it is given by mouth are absorbed from the intestine, so that the oil is utilized by the body as a food, and in China it is actually taken as an article of diet.

On account of its mild but certain action and the absence of griping, castor oil is perhaps the most valuable of all purgatives for occasional use, a dose of half an ounce or an ounce being generally required. The regular administration of half or one ounce at night or night and morning is one of the best methods of treating senile constipation, and it is often the only purgative which is effective in spastic constipation and in muco-membranous colitis, especially when opium or belladonna is given simultaneously.

The great disadvantage of castor oil is its nastiness, which, however, is comparatively slight in the best preparations. The nastiness is mainly due to its smell ; it can therefore be to some extent overcome by holding the nose. The unpleasant after-taste, which is due to traces left in the mouth, is diminished if the mouth is previously well moistened with lemon-juice, brandy or peppermint-water. Small doses may be taken with an equal quantity of glycerine or in capsules containing half a drachm, but the latter are too bulky for some people to swallow. Larger doses are best taken in one gulp with lemon-juice or peppermint-water, with which the medicine-glass should also be rinsed before pouring in the oil.

3. *Saline purgatives and natural purgative waters.* We 5 have recently proved that the commonly accepted theory of the physical action of saline purgatives is erroneous. When a saline purgative was taken in water with bismuth oxychloride before breakfast, auscultation of the cæcal sounds and a skiagraphic examination showed that the salt reached the cæcum in four hours, although a watery stool was passed two and a half hours earlier. The reliability of the X-ray investigations was proved by observations on two patients with fistulæ of the end of the ileum ; it was found that the soluble purgative salt travelled no faster than the heavy and insoluble bismuth salt. By analysing the watery stools after purgation with sodium sulphate, it was found that the percentage of the salt they contained was not increased, the greater part of it being excreted the next day when the motions were solid. Hence the semi-fluid character of the first stool was not a result of water being attracted into the intestines by the salt, and the presence of excess of salt in the second stool did not cause it to be watery. As half of the salt was excreted in the urine within eight hours of being taken, and as the salt had not reached the colon by the time the watery evacuation was produced, the only possible explanation is that saline purgatives are absorbed from the small intestine and act from the blood on the neuro-muscular mechanism of the colon, producing increase of motor and secretory activity ; this view was

propounded by Aubert[6] in 1852, but it received no support from any of the host of writers on the subject, with the exception of MacCallum[7] in 1903.

Saline purgatives are best given dissolved in a considerable volume of water, because, as the experiments of Otto[8] have shown, solutions of salts are retained in the stomach and do not enter the duodenum, until they become isotonic with the body fluids by dilution with the secretion of the gastric mucous membrane. Thus the nearer the solution of the salt is to being isotonic with the blood-plasma, the more rapidly will it pass into the small intestine, from which it is absorbed. Moreover, water alone taken before breakfast, especially if it is cold, acts as a mild stimulant to intestinal activity, and this effect is still present when a saline purgative is dissolved in it. The salt should be taken on an empty stomach, as it then passes directly into the small intestine. If food is present in the stomach, the salt passes slowly out with it, so that its excretion by the kidneys may be almost as rapid as its absorption from the intestines; the result is that no purgative action is produced, but disturbances in gastric digestion often occur, owing to the interference with the secretion of gastric juice and the inhibition of ferment action, to which it gives rise.

A saline aperient is best taken a short time before breakfast, because then the specific action of the salt is augmented by the stimuli to peristalsis, which normally occur at that time, the most important being the taking of food into an empty stomach. The importance of this factor is shown by the observation that in one individual a drachm of magnesium sulphate, taken before breakfast, produced an evacuation in thirty-five minutes, whereas the same dose given another morning, when no breakfast was taken, required seventy minutes to produce its action.

When a dose of a saline purgative, sufficient to produce a single copious and semi-liquid stool, is given, the whole of the large intestine from the cæcum to the rectum may be completely emptied. This was well shown in an individual, who had taken two ounces of bismuth oxychloride with bread and milk at midnight, so that at nine o'clock the following morning the shadows of the cæcum and the ascending and descending colon were distinctly visible with the X-rays. A drachm of magnesium sulphate in half a pint of water was then drunk, and soon afterwards breakfast was taken. The breakfast was found, as usual, to have produced an advance in the most forward part of the shadow, but there was otherwise no change in it. Half an hour later the aperient acted, a copious semi-fluid stool being passed. Every trace of a shadow had now disappeared, the cæcum being as completely emptied as the pelvic colon. Our investigations on normal and constipated individuals and on a patient with a fistula of the end of the ileum have proved that saline purgatives produce little or no acceleration in the passage of the chyme along the small intestine, the colon being thus the part of the bowel, upon which the salt present in the blood-stream acts most strongly.

These observations show that saline aperients are particularly indicated, when it is desired to produce a complete evacuation of the colon without interfering with digestion in the small intestine. They have the advantage in such cases over many vegetable purgatives, such as cascara sagrada and castor oil, in that they produce none of the acceleration in the passage of chyme through the small intestine, which leads to diminished digestion by the pancreatic and intestinal juices.

Saline purgatives do not suit all people, as in some they produce abdominal discomfort, nausea and headache, without acting on the bowels. But many individuals find them the most pleasant form of aperient, their action being, as a rule, very reliable and unaccompanied by disagreeable symptoms. They tend, however, to produce depression in nervous individuals, owing to the loss of a considerable amount of fluid, for they differ from vegetable purgatives in increasing the secretory as well as the motor activity of the large intestine. The softness of the stools, which result from the use of saline purgatives, renders them particularly useful for patients with hæmorrhoids, anal ulcer and painful pelvic conditions.

The sulphates of soda and magnesia are equally reliable, but the latter has the disadvantage of possessing an unpleasant bitter taste. Sodium sulphate is best taken either by itself, or mixed with sodium bicarbonate and tartaric and citric acids as the pharmacopœial effervescent salt, in a tumbler of cold water, which should be slowly drunk whilst dressing. A drachm is generally the best dose to begin with, but the exact dose requires regulating until the desired effect is produced. As an alternative, sodium sulphate can be given three times a day in doses varying between twenty grains and two drachms; its efficacy can then be greatly increased by the addition of five minims of liquor strychninæ to each dose. When a purgative is required in cases of chlorosis, sodium sulphate can be added to an iron and arsenic mixture.

Instead of a sulphate, magnesia may be given when constipation is associated with any form of gastric disturbance which is relieved by alkalies, whether hyperchlorhydia be actually present or not. Theoretically, the equivalent dose of the oxide is about one quarter of that of the sulphate, but if it is taken in the following way, much less is required, as it can be made to neutralize the gastric contents, the acidity of which is in some obscure way the cause of much of the gastric discomfort and also of the constipation. The patient should always have a small box of magnesia with him: as soon as the first suggestion of gastric pain develops after a meal, he should put a very small quantity of the powder on his tongue and swallow it with a little water, and should continue to do this whenever he feels the least discomfort. By this means the pain is never allowed to develop fully, and exactly the necessary quantity of magnesia is taken, in contrast to the excessive quantity and uncertain action of an alkaline mixture given in a fixed dose at fixed periods in the day. As a rule, four or five grains of magnesia after each meal are sufficient to prevent the occurrence of any pain, and at the same time to overcome the constipation.

Sodium sulphate is the chief ingredient of the hot Karlsbad and the cold Elster, Marienbad, Franzensbad and Tarasp waters (*vide* table); it is associated with magnesium sulphate

Composition of the Principal Natural Purgative Waters.

Description.	*Temperature (Fahrenheit).*	*Grains per pint.*			
		Magnesium sulphate.	*Sodium sulphate.*	*Sodium bicarbonate.*	*Sodium chloride.*
Alkaline, sulphated. Cold:					
Elster (Saxony)	48°	—	45	14	8
Marienbad (Bohemia)	50°	—	43	14	13
Franzensbad (Bohemia)	50°	—	30	8	10
Tarasp (Engadine)	44°	—	20	40	30
Alkaline, sulphated. Hot:					
Karlsbad (Bohemia)	160°	—	22	12	10
Weak, sulphated:					
Kissingen (Bavaria)	65°	—	10	0	80
Châtel-Guyon (France)	90°	—	5	7	14
Bitter, sulphated:					
Cheltenham	—	15	7	—	—
Imported:					
Rubinat (Spain)	—	28	800	—	16
Franz-Joseph (Budapest)	—	200	200	—	—
Apenta (Budapest)	—	200	180	—	12
Æsculap (Budapest)	—	200	160	—	23
Hunyadi-Janos (Budapest)	—	140	140	—	12
Pullna (Bohemia)	—	86	110	—	20
Seidlitz (Bohemia)	—	110	—	—	—
Friedrichshall (Saxe-Meiningen)	—	45	55	—	70

in the much weaker Cheltenham waters and in the strong imported bitter-waters, such as Franz-Joseph, Æsculap, Hunyadi-Janos, Friedrichshall, Rubinat, Apenta and Seidlitz. The Karlsbad and the mildly purgative Kissingen and Châtel-Guyon waters are supposed to have a specially favourable influence on constipation associated with catarrhal colitis, and those of Marienbad and Franzenbad are chiefly recommended for constipation, when it is complicated by obesity or hæmorrhoids. There is, however, no evidence to show that these natural waters have any advantage over a simple solution of sodium sulphate or artificial Karlsbad or Seidlitz * salts. It is a common experience, moreover, that drinking the waters at one of the popular continental health resorts produces nothing more than temporary improvement of constipation, which lasts no longer than the period of the 'cure'. Boas says that he has never seen any permanent benefit result among many hundreds of his private patients, who had visited the various spas for constipation. The accessory treatment in the form of diet and exercise and the removal from business or household worries are of much more importance than the waters themselves, but there is no need to go to such expensive and distant places as Marienbad and Karlsbad for the treatment, as artificial saline purgatives can be taken much more conveniently at any English health resort, and natural waters can be drunk at Cheltenham. The purgative action of Harrogate water is not strong, as its chief constituent is common salt; it also contains a little sulphate of soda and large quantities of sulphuretted hydrogen, which makes it exceedingly unpleasant to drink. But the excellent arrangements for hydrotherapy and for the Plombières intestinal douche (p. 325) make Harrogate one of the best resorts for patients with constipation, associated with fæcal retention, if treatment at home has not proved successful.

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* Artificial Seidlitz powders, however, bear no resemblance to the genuine Seidlitz water, as they depend for their activity on sodium tartrate instead of magnesium sulphate.

4. *Mercurial purgatives.* Salts of mercury exert an irritant action on the intestines. Larger doses produce congestion, necrosis and ulceration of the mucous membrane, especially of the colon; watery, blood-stained stools are passed, and intense pain and tenesmus are present. In small doses the irritation leads merely to a slight increase in the motor and secretory activity of the intestine, a soft stool being produced without pain.

Mercurial purgatives were formerly believed to act by increasing the flow of bile, but observations on animals and on men with biliary fistulæ have shown conclusively that they are without action on the liver. The belief arose from the fact that green stools are sometimes passed when calomel has been given: this is now known to be due to the prevention of the decomposition of the bile by the antiseptic action of the calomel and not to any increase in the flow of bile.

The insoluble preparations of mercury are alone used as purgatives, as they do not irritate the stomach and are absorbed to a very slight extent only. They are partly dissolved in the intestines and then exert their action on the mucous membrane. Calomel is the mercurial most commonly used at the present day, but metallic mercury in the form of blue pill or grey powder is still often given.

Mercurial purgatives are very valuable for occasional use, particularly in so-called ‘ biliousness ’, in which the furred tongue, anorexia, general malaise, headache, discoloured conjunctivæ and constipation result really from gastro-intestinal disorder and not from any hepatic condition. They are also valuable in diarrhœa resulting from excessive putrefaction, in which they act mainly as evacuants, but to some extent as intestinal antiseptics.

Mercurial purgatives should never be employed in the treatment of chronic constipation, as they produce too much irritation of the intestinal mucous membrane, and their constant use is likely to result in symptoms of mercurial poisoning. The regular use of grey powder for the constipation of infants is, however, strongly recommended by Still (p. 332).

5. *Substances which increase the bulk of the fæces.* It might be supposed that the form of constipation, which is due to absorption by the intestine being so active that very little fæces remain to be excreted (*vide* p. 64), required no treatment. But the occurrence of symptoms in severe cases makes it probable that the small quantity of fæces formed remains so long in the intestines before sufficient accumulates in the pelvic colon to produce an effective stimulus to defæcation, that an abnormally large proportion of the poisonous constituents of the fæces is absorbed. It is therefore advisable to attempt to obtain an evacuation either every day or on alternate days. Adolph Schmidt[9] and Neville Wood[10] independently came to the conclusion that this could best be done by increasing the bulk of the fæces by the administration of some substance, which passes through the intestines without undergoing decomposition or absorption. Schmidt recommends more particularly agar-agar ; he also suggested the use of paraffin, which is the substance Wood had already given for the purpose. The use

of bread made with wood-shavings has been advocated in Germany. Agar-agar is prepared from certain East Indian sea-weeds and consists mainly of hemi-cellulose, which is unaffected by the digestive juices and is for the most part unabsorbed.* Lohrisch, working under Schmidt's direction, found that it also diminished the absorption of the food, especially of cellulose. It readily absorbs water, each drachm taking up about 100 c.c., so that a comparatively small quantity taken by mouth yields a considerable volume of material for excretion. The ordinary dose is one teaspoonful, which should be taken in mashed potatoes or with stewed apples at the mid-day meal. Sometimes the dose has to be increased, but it is rare for more than half an ounce to be required; the larger doses should be divided between the different meals. Pure agar-agar can be obtained as an almost tasteless, non-irritant powder, but Schmidt recommends the addition of a small quantity of cascara sagrada in order to replace the stimulating decomposition products of the food, which are present in these cases in abnormally small amount: the dose of cascara is quite insufficient by itself to produce any purgative action. The combination of agar-agar with cascara is sold under the name of *regulin.* When regulin acts favourably, it first appears in the stool after three or four days; it is generally advisable to begin the treatment with an ordinary purgative or an enema. Schmidt found that about two-thirds of the cases of constipation, which he treated with regulin, improved: in some treatment for only one or two weeks was required, but in others the use of regulin had to be continued permanently. The chief disadvantage of regulin is the unpleasant bitter taste, which is given to it by the cascara, so that it is not easy to persuade patients to take more than a teaspoonful of it in a day. In rare cases, as in one described in an earlier chapter (p. 67), regulin may apparently give rise to very serious symptoms.

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* In severe cases of greedy colon, agar-agar is apparently digested by bacteria. Thus in Case 5, 12 grms. were being taken a day, but the daily excretion of fæces was only 0·8 grm. more than before. Hence at least 11·2 grms., or 93 per cent., were absorbed.

Liquid paraffin is not absorbed in the alimentary canal; it is non-irritating and seems never to have produced any unpleasant symptoms. It is, however, disagreeable to take, and is best prescribed with a few drops of some aromatic oil. From one to six drachms should be given, divided into two or three doses; sometimes the dose may be gradually reduced until a single dose of a drachm is taken every night. It is particularly valuable when the fæces are very hard and dry; it is therefore useful in certain other forms of constipation besides that due to a greedy colon, as, for example, in diabetes. In dyschezia also the soft stools, which result from its use, are expelled with less difficulty than ordinary fæces. Schmidt recommends the addition of a small quantity of cascara to the paraffin, the mixture being known as *pararegulin*; its taste, however, is so unpleasant that it has to be given in capsules, and, as six or eight must be required in a day, it is not a convenient remedy.

Although agar-agar and paraffin are undoubtedly useful in some cases of constipation due to a greedy colon, the slighter forms are much more rationally treated by diet alone, as an increase in the quantity of indigestible material in the food not only itself adds to the bulk of the fæces, but it also increases the secretion of intestinal juice, and so adds to the quantity of stimulating decomposition products in the intestine by providing a more abundant culture-medium for the intestinal flora.

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[1] A. Trousseau: *Clinical Medicine*, iv, 192. Eng. Trans., 1871.

[2] R. Magnus: *Pflüger's Archiv*, cxxii, 251, 1908.

[3] A. Hiller: *Zeitschr. f. klin. Med.*, iv, 481, 1882.

[4] P. Kohlstock: *Charité-Annalen*, xvii, 283, 1892.

[5] A. F. Hertz, F. Cook and E. G. Schlesinger: *Proc. Royal Soc. Med.*, Dec., 1908 and *Guy's Hosp. Reports*, lxiii, 1909.

[6] Aubert: *Zeitschr. f. rat. Med.*, ii, 225, 1852.

[7] J. B. MacCallum: *Am. Journ. Phys.*, x, 101 and 259, 1903.

[8] E. Otto: *Arch. f. exp. Path. u. Pharm.*, lii, 370, 1905.

[9] Ad. Schmidt: *Münch. med. Woch.*, lii, 1970, 1905.

[10] Neville Wood: *West London Med. Journ.*, xi, 99, 1906.

CHAPTER V

ENEMATA AND SUPPOSITORIES. REMOVAL OF IMPACTED FÆCES

ONE of the oldest treatises on medicine in existence, an Egyptian papyrus dating from the fourteenth century B.C., which is now in the Royal Museum in Berlin, gives directions for the preparation of enemata. Enemata were in common use among the ancient Egyptians: Herodotus[1] (443 B.C.) wrote that 'they clear themselves on three consecutive days in each month, seeking after health by emetics and enemata (κλύσματα), for they think that all disease comes to man from his food.' The Egyptians ascribed the discovery of enemata to the ibis: 'in this same Egypt,' says Pliny[2] (A.D. 77), 'the bird called the ibis has taught us something similar. He washes the inside of his body by introducing water with his beak into the channel, by which our health demands that the residue of our food should leave.' Hippocrates (460 B.C.) considered that enemata were preferable to purgatives except in very strong patients, and recommended the use of cylindrical suppositories of honey smeared with ox-gall as a still milder form of treatment. In early times enemata were given from a bladder or skin fixed to a metal or bone tube; the enema syringe was invented in the fifteenth century.

(*a*) **Uses of enemata.**—Enemata are used in the treatment of constipation with the object of (1) producing an immediate evacuation of the large intestine, and (2) softening hard accumulations of fæces, so that they may subsequently be more easily evacuated.

1. *Enemata as evacuants.*—Enemata empty more or less of the large intestine by stimulating its movements, (i) mechanically, (ii) thermally and (iii) chemically.

(i) *Mechanical stimulation.* The distension of the intestine with fluid acts as a powerful stimulus to contraction, the strength of which depends on the volume of fluid injected and the method of injection, the latter being the more important factor. If no obstruction is present, two pints of water can be run into the colon under low pressure without stimulating its movements at all, as most of the large intestine is normally almost empty, so that the bulk of its contents can be greatly increased without stretching its walls. When, on the other hand, an enema is given with a syringe, the rapid intermittent increase in pressure in the lowest part of the intestine acts as a powerful mechanical stimulus, which causes it to contract.

(ii) *Thermal stimulation.* The stimulating action of enemata can be considerably increased by using fluid which is not at the body temperature. As water at a temperature more than a few degrees above that of the body is injurious to mucous membranes, the effect of the hottest enema which can be safely given differs little from that of one which is thermally indifferent, and indeed there is some evidence to show that it exerts a slight sedative influence. On the other hand, water at a temperature of as much as 60° F. below that of the body does not injure the intestinal mucous membrane. As the application of cold stimulates peristalsis, the efficacy of enemata can be greatly increased by using cold instead of hot water. The stimulation produced by water between 60° and 70° F. is, however, generally sufficient, as colder water is liable to produce such violent contractions that severe colic results and the enema is at once rejected.

In spastic constipation and in muco-membranous colitis, injections at the body temperature or slightly above it help to relieve the spasm in addition to emptying the colon. On the other hand, cold enemata increase the spasm and may cause considerable pain.

(iii) *Chemical stimulation. Water* and *normal saline solution* do not produce any chemical stimulation of the intestines. I have not been able to find out with what object *soap solutions*, which have been more frequently employed as enemata than ordinary water ever since the latter part of the eighteenth century, were first introduced. The presence of the soap perhaps increases the efficacy of enemata to a slight extent by mildly stimulating the intestinal mucous membrane.

Owing to its power of abstracting water from tissues, *glycerine* acts as an irritant to mucous membranes. The injection of one or two drachms of pure anhydrous glycerine into the rectum acts as a powerful stimulus, which gives rise to a defæcation reflex, often sufficiently strong to cause the bowels to be at once well opened. As a rule its action is quite painless, but occasionally it causes some tenesmus, which can be prevented by mixing the glycerine with an equal quantity of water. As the irritant action of glycerine depends on its dehydrating power, it is useless unless injected in a concentrated state. Hence the addition of an ounce to a pint of water, which has sometimes been recommended, cannot materially increase the efficacy of an enema.

Glycerine suppositories are as effective as glycerine enemata and have the advantage that they can be very easily introduced into the rectum by the patient himself. They rapidly dissolve in the rectum, so that they generally act within a few minutes. Only those containing more than 95 per cent. of anhydrous glycerine should be recommended : one or two drachm suppositories can be used for adults, and a quarter or half a drachm for children. The solid suppository produces a mechanical stimulus in addition to the chemical stimulus of the glycerine.

Glycerine enemata or suppositories should not be recommended for patients with hæmorrhoids on account of their irritant action. It is also unwise to use them regularly for long periods, as they tend to diminish the sensibility of the rectal mucous membrane. But they are very valuable for occasional use, especially in the milder forms of dyschezia depending on insufficiency of the defæcation reflex, when the extra stimulus they produce is often sufficient to lead to defæcation. They should be used only after an attempt to open the bowels naturally has failed : a glycerine suppository will then often produce a single evacuation without delay, the stool being of normal consistency, so that no nutrient material or excess of fluid is lost. Under such circumstances they are more convenient than either purgatives or enemata.

As vegetable purgatives act by directly stimulating the intestinal mucous membrane, they should be effective when injected by rectum. It is a curious fact, however, that at the present time they are much less frequently administered in this way than formerly: in the Guy's Hospital Pharmacopœia of 1837, directions are given for making enemata of aloes, of colocynth, of colocynth with frangula and of castor oil, but the last is the only one still present in the edition of 1899. Kohlstock's[3] investigations showed that there can be no doubt about the activity of such purgatives as aloin, cathartic acid and colocynthin when injected by rectum. But castor oil has no action on the intestines until it is split into glycerine and ricinoleic acid; when given as an enema, it is generally retained too short a time for this to occur, so that it probably has no more effect than a non-purgative oil, such as olive oil.

Schüpbach[4] has shown that *bile* stimulates the motor activity of the colon, but not of the small intestine; it has, therefore, a mild purgative action if added to an enema, and a small quantity of undiluted bile gives rise to a defæcation reflex, which, however, is much feebler than that produced by glycerine.

Turpentine and *asafoetida* stimulate peristalsis, and when added to enemata they are supposed to be specially efficacious in causing the expulsion of flatus from the rectum, but why the contractions they give rise to should act particularly on the gaseous rather than the solid contents of the intestines has never been explained. As turpentine and asafoetida appear to be equally active, the former is preferable on account of the exceedingly unpleasant smell of the latter; an ounce should be used as an emulsion in a pint of starch mucilage.

(iv) *Varieties of enemata, depending on method of administration and amount of fluid used.*—According to the method of administration and the amount of fluid used, enemata may act on (*a*) the whole colon, (*β*) the pelvic colon and rectum, or (*γ*) the rectum alone.

(*a*) *High enemata.* If fluid is run under a constant pressure of not more than three feet of water from a funnel or douche-can through an india-rubber tube into the intestine, it reaches the cæcum without difficulty, as I have been able to watch with the X-rays when a bismuth salt was suspended in the fluid. It is quite unnecessary to assume any of the special positions or series of positions, which have often been recommended, as the fluid runs in equally easily when the patient lies on his back or on either side.

When a large injection under low pressure has to be made, difficulty is sometimes experienced in introducing the fluid beyond the pelvi-rectal flexure ; this can generally be overcome by increasing the pressure for a moment. It is generally useless to introduce the tube more than three or four inches, as X-ray observations show that when it reaches the pelvi-rectal flexure its end turns backwards towards the anus, from which it may finally project. Occasionally a hard india-rubber tube may be pushed into the pelvic colon, but it is dangerous to exert much force ; if no other means succeed, the tube may be introduced into the pelvic colon through a sigmoidoscope.

If between one and a half and three pints of water are introduced into the colon in this way, the whole of it is slightly distended and the pelvic colon, if it has not already done so, rises into the abdominal cavity, so that the resistance offered at the pelvi-rectal flexure is diminished. If a desire to defæcate is not felt at once, the fluid should be retained for a quarter of an hour. An effort should then be made to defæcate ; the increased intra-abdominal pressure, acting on the filled large intestine, stimulates it to such an extent that strong contractions occur throughout its length and the water is expelled, carrying with it most of the contents of the colon. On the rare occasions in which all the water is retained, a further quantity should be injected, when a second effort to defæcate will almost certainly be successful. There is no danger of over-distending the gut so long as the fluid is introduced at a low pressure.

It is important that a proper position should be assumed during defæcation after the administration of an enema : the full benefit of treatment with enemata is sometimes not obtained owing to the common practice, especially in hospitals, of letting the patient lie or half sit on a bed-pan, so that it is quite impossible for him to make a proper effort to defæcate, instead of allowing him to get out of bed and use the water-closet.

(β) *Low enemata.* When an enema is administered in the ordinary way by means of a Higginson's syringe, the rectum and pelvic colon are so quickly stimulated to contract that it is generally difficult to inject more than a pint of fluid, and not much of this gets beyond the pelvic colon. The effect of such an enema is therefore to produce a very strong stimulus to the rectum and pelvic colon, which leads to their contraction not only directly, but also indirectly, by causing a strong reflex stimulation of defæcation. These enemata, like the larger injections, also have the effect of making defæcation more easy by raising the pelvic colon.

In severe cases of dyschezia enemata should not be given with a syringe, as the atonic rectum and pelvic colon do not respond to the mechanical stimulation, but simply become over-distended by the fluid, their paretic condition being thereby aggravated.

The nozzle of the enema syringe should be made of moderately soft rubber, as an ivory or bone nozzle may produce serious injury to the intestine: thus there is a specimen in the Guy's Hospital Museum (No. 934) of a rectum, the anterior wall of which was perforated an inch and a half from the anus by an enema-tube, passed by the patient himself.

(γ) *Rectal enemata.* When not more than four ounces of fluid are injected, they do not as a rule reach beyond the rectum. As their mechanical effect is very small, they must either be cold so as to produce a thermal stimulus, or contain some chemical stimulant, such as glycerine, ox-gall or aloin. In either case the stimulus may give rise reflexly to defæcation.

When constipation is complicated by the presence of hæmorrhoids, the injection of two to four ounces of cold water immediately after defæcation has often a very good effect by causing the vessels to contract; or half a pint of cold water may be injected, as first recommended by Sir

Benjamin Brodie,[5] every day immediately after breakfast and retained, if possible, for several minutes.

2. *Enemata as solvents.* The force required to propel hard fæces along the last part of the large intestine and to expel them in the act of defæcation is sometimes so great that it becomes necessary to soften them before any other treatment can be effective. This principle was recognized by van Swieten:[6] 'the best remedy in the power of art is to divide the too gross fæces . . . by the very emollient decoctions of marsh-mallows, common mallows, linseed, &c., to moisten and dilute the too dry parts; to anoint and lubricate the sides of the intestines . . . by the injection of clysters. . . . Then and not before it will be convenient to stimulate and increase the expulsive powers, whether it be attempted either by giving a purge, a sharp clyster, or lastly . . . by introducing a suppository into the anus.'

The fæces can best be softened and made less adherent to the intestinal mucous membrane by introducing fluids by rectum, in such a way that they are not expelled immediately, but are retained for a time so that they can alter the consistency of the fæces, with which they are in contact.

(i) *Olive oil* has been most commonly used for this purpose. Although it was employed as long ago as A.D. 100 by Soranus the elder of Ephesus, and its value was recognized by various physicians at different periods, it had fallen into almost complete disuse, when it was re-introduced by Kussmaul in 1893. Its mode of action was specially studied by Fleiner,[7] and its use was popularized particularly by Ebstein[8] in Germany. The opinion of these authorities that it acts chiefly by its 'solvent' power on fæces is generally accepted. Both Penzoldt[9] and Schilling,[10] however, have proved experimentally that oil has very little effect on fæces, and my own observations fully confirm this. A hard fæcal mass kept in contact with oil at the body temperature does not disintegrate even after twelve hours, and only a slight softening of the superficial part occurs. On the other hand, I found that contact with water at the body temperature for four hours caused the hardest scybala to crumble completely away when shaken; considerable softening of the whole mass occurred already in half an hour, and even in a quarter of an hour a greater effect was achieved than oil could produce in twelve hours. Cold water was much less effective. The action of water was not increased by the addition of salt or turpentine, but my observations confirm the statement of Penzoldt and of Schilling that soap solution produces a slightly greater effect than plain water.

(ii) *Ox-gall* is said by Herschell[11] to be an even more powerful 'solvent' of fæces than he believes oil to be, the combination of the two being, in his opinion, 'one of the most efficient solvents of fæcal matter that it is possible to conceive.' My experiments, however, show that pure ox-gall has less action than water on fæces, and its addition to water has not the slightest effect on its power of softening and disintegrating fæces. As, however, oil has hardly any softening action at all, a mixture of equal parts of ox-gall and oil has, of course, much more effect than oil alone, but less than pure water.

(iii) *Water* is too rapidly absorbed from the rectum for a single injection to have much effect in softening fæces. This drawback can be overcome by giving repeated injections of water at the body temperature, the amount used depending on whether the fæcal mass is in the rectum only, in the rectum and pelvic colon, or in the less accessible parts of the colon also. Between three and six injections at intervals of half an hour soften even the hardest fæces, to such an extent that an effort to defæcate after the last injection generally proves successful.

Although the softening action of oil on fæces is negligible, oil injections are undoubtedly sometimes of value in constipation. The oil detaches scybala from the intestinal walls and lubricates the mucous membrane, so that the expulsion of the fæces is facilitated. As it is only very slightly absorbed, its injection in the evening prevents the absorption of water from the fæces collected in the pelvic colon, so that no increase in their hardness occurs during the night. Oil has also a soothing effect upon the mucous membrane when catarrh is present, and it diminishes the tendency to spasm of the intestines and the sphincter ani in spastic constipation. Lastly, Fleiner showed that, if oil is retained in the intestine for some hours, it is partly decomposed into glycerine, fatty acid and soap, which act as mild stimulants to the motor activity of the pelvic colon and rectum. Oil enemata are, therefore, specially indicated in spastic constipation and in muco-membranous and other forms of colitis, which are secondary to constipation.

Injections of olive oil are best given on retiring to bed in the evening, and they should be retained until the morning. About five ounces should be used on the first occasion ; if the treatment has to be repeated the amount should be gradually increased to ten ounces. The olive oil, which must be absolutely pure, is warmed to 100° F., and then slowly introduced into the colon from a funnel or douche-can suspended two or three feet above the level of the body. A little cotton-wool should be placed between the buttocks during the night, in case a few drops escape from the anus. In the morning the bowels are sometimes satisfactorily opened without further assistance, but more often the injection of a high enema of water is required. On rare occasions a desire to defæcate is felt during the night ; in spite of the inconvenience it should not be resisted.

The oil treatment occasionally gives rise to unpleasant symptoms, such as gastric discomfort, loss of appetite and nausea ; Crämer[12] says that an oily taste in the mouth may occur, and he has met with three cases in which oil injected by rectum was vomited. In other cases severe pain is produced, and I have seen a man of twenty-five suffering from recurrent attacks of severe colitis, the first of which had been produced by an enema of olive oil. Such occurrences, however, can probably be avoided by using only the purest oil.

(*b*) **General indications for the use of enemata.** The majority of cases of moderately severe constipation are more or less cumulative, excess of fæces being always present in the large intestine. It is therefore necessary that the colon should be completely evacuated before other methods of treatment are adopted. This important principle was enunciated by Stephen Hales[13] nearly two centuries ago. He found that water, introduced into the stomach of a dog at a pressure of two feet, flowed out of the anus, if the fæces were of normal consistency; but 'when in another Dog a Tube was fixed to the Gullet, and Water was poured in so as to burst the Stomach and one of the Guts, yet there being hard Fæces in the Rectum, no Water passed thro' it. From this Experiment,' he concludes, 'we see how requisite it is, in some colicky Obstructions of the Bowels, to promote the Operation of Purgatives with Clysters; without which, Purgatives may in some cases do more harm than good, while they increase the painful Distension of the Bowels, without being able to pass and carry off the noxious Mass.'

(1) *In cases of constipation without dyschezia.*—In mild cases of constipation it is generally possible to empty the bowels completely by means of a dose of castor oil or calomel, followed, if necessary, by a saline purge. In severer cases, especially if the constipation is of long standing, the accumulation of fæces in the large intestine must be completely removed by enemata before other treatment is attempted. In confirmed cases, in which improvement occurs only slowly, it is often advisable to give occasional enemata for some weeks. A good rule to follow is that an enema should be used whenever a really satisfactory stool has not been procured for two consecutive days, in spite of the treatment being regularly carried out. In cases of this sort a high enema of one and a half or two pints of warm water should be used. An attempt should be made to retain it for fifteen or thirty minutes, in order that it may have time to soften the fæces. It is often advisable to give a second similar injection immediately after the first has been expelled; it need not be retained for more than a couple of minutes, and its stimulating action can be increased by giving it cold. The toxic symptoms, which occasionally follow the use of a single enema in severe cases of fæcal retention, are prevented by this means, as they are due to the absorption of poisons set free by the partial disintegration of the fæces by the water, which does not completely evacuate them.

When a satisfactory result is not obtained by the two enemata owing to the hardness of the fæces, several should be given at intervals of half an hour, or, if there is any catarrh or spasm of the colon, an olive-oil injection should be given the previous evening and retained during the night. It is often necessary to repeat the treatment for two, three or more consecutive days before the colon is completely evacuated.

The occasional enemata given after the regular treatment has been begun can be of the same sort; but a smaller quantity of fluid, injected with a Higginson's syringe, or a brisk purge is often effective, if used before any considerable amount of fæces has had time to reaccumulate.

When the constipation is accompanied by much flatulence, an ounce of turpentine may be added to each pint of the enema.

(2) *Dyschezia.*—The most important part of the treatment of dyschezia is to keep the rectum and pelvic colon empty, so that they may in time regain their normal tone and contractile power. This can only be accomplished by the regular use of enemata.

This plan of treatment has hitherto not received the attention it deserves. The patients are generally given purgatives, and an enema is administered only after they have had little or no result for several days, apparently under the impression that the purgatives, given regularly for some time, at last bring the fæces into a position where an enema can act upon them. As a matter of fact, in uncomplicated cases the enemata are equally effective if no purgatives are given, an attack of colic being in many instances the only result of the administration of the latter.

It has been said that the regular use of enemata is always harmful; this belief is, however, erroneous, and in many cases of dyschezia it is the only means which can result in complete recovery. Even in the most obstinate cases the ultimate result of the treatment is often very satisfactory, although the enemata may have to be given regularly for a year or longer before the rectum and pelvic colon return to their normal condition, as in Case 15. In very exceptional cases the paralysis and anæsthesia of the rectum are so complete that recovery is impossible; in such cases treatment by enemata, though it does not cure, is the only way in which a regular evacuation can be obtained. I know a medical man, seventy-one years old, who has never failed to obtain an easy evacuation of his bowels every morning for the last twenty-four years by means of enemata of three pints of soap and water.

The use of enemata should be discontinued as soon as the power to empty the bowels completely without artificial aid has returned. The exact moment when this occurs can only be recognized by instructing the patient to make an attempt to defæcate every day before he has an enema, even if he never experiences a desire to do so. If the attempt is completely unsuccessful, or if only a small proportion of the fæces in the rectum is evacuated, an enema must be given.

In slight cases, in which the contractile power of the rectum and pelvic colon is not greatly impaired, an increase in the stimulation of the rectal mucous membrane is generally sufficient to produce reflexly an efficient defæcation. For this purpose a glycerine enema or the more convenient glycerine suppository should be used.

When glycerine fails to act, the muscle can often still be caused to contract by the mechanical stimulus, produced by the injection of about a pint of water by means of a Higginson's syringe. If plain warm water is ineffective, the stimulus can be increased by using cold water or by the addition of soap or senna to it.

In the severest cases the muscular power of the pelvic colon and rectum is so feeble that it can never contract in response to any stimulus with sufficient force to expel all its contents. Under these circumstances a high enema should be given at very low pressure; on then making an effort to defæcate, the large intestine above the pelvic colon, being normal, contracts on the fluid it contains with sufficient force to expel the greater part through the anus, the water carrying with it most of the fæces collected in the pelvic colon and rectum.

Nervous patients occasionally feel exhausted after an enema has been administered, and others complain of abdominal pain. Both these drawbacks can be avoided by giving the enema just before the patient retires to bed instead of in the morning. Sometimes a belladonna suppository, introduced half an hour before the enema is injected, prevents the occurrence of pain or discomfort. In rare instances an attack of syncope, which may even be fatal, occurs in old people after the administration of an enema. Dr. Hale White tells me that for this reason he considers that elderly patients should always open their bowels whilst lying down, if an enema has been given.

(*c*) **Removal of impacted fæces.**—It is generally unwise to give purgatives when fæces have become impacted in the intestines, as the colic, which is generally present, indicates that the intestinal musculature is already contracting very actively, and that it is unlikely that any additional stimulation will result in a sufficient increase in the force of the contractions to overcome the obstruction. Belladonna is more likely to do good, by relieving the pain and causing the contractions to become more orderly and less spasmodic.

In slight cases of fæcal impaction in the rectum, the expulsion of the mass can be greatly facilitated by applying pressure with the fingers just in front of the coccyx, so that the rectal ampulla is converted into an inclined plane, over which a comparatively slight expulsive effort causes the mass to glide, the action being similar to the support of the fœtal head during labour by the accoucheur.

The most rational treatment in severer cases is by means of enemata. In the comparatively rare instances, in which the fæces are so tightly impacted in the rectum that enemata fail to act, a method recommended by Ebstein[14] may be tried. The patient lies on his left side and the finger is pressed deeply into the right ischio-rectal fossa; it may then be possible to express the whole of an impacted mass of fæces from the rectum. If the fæces are very hard, they should be previously softened by means of repeated injections of a few ounces of water at short intervals. In severe cases of rectal impaction in women, the mass can sometimes be evacuated by two fingers introduced into the vagina.

There are, however, a number of cases in which all these methods fail to empty the rectum. Under such circumstances it is necessary to remove the fæces piecemeal by a finger introduced into the rectum. This is much more effective and much less likely to injure the rectal mucous membrane than removal by means of a metal scoop or the handle of a spoon. When digital evacuation is required, it is generally necessary to give an anæsthetic, as the dilatation of the sphincter and the manipulation, which is often very prolonged, are always painful. The evacuation is much facilitated by simultaneously irrigating the intestine with water through a tube inserted into the rectum by the side of the finger. In this way small fragments of fæces are washed out, as the large masses are broken down by the finger. When the accumulation is not confined to the rectum, it is sometimes possible, by a hand placed on the abdomen, to press the fæces from the pelvic colon into the rectum, after the latter has been evacuated.

If enemata fail to remove the fæces in the exceptional cases, in which the accumulation occurs only in the pelvic colon completely out of reach of a finger introduced into the rectum, the colon should be washed out, water being introduced through one tube and escaping with the fæces through a second larger tube placed at its side. When this proves unsuccessful, the fæces should be removed through a proctoscope or sigmoidoscope (Tuttle[15]).

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[1] Herodotus: Lib. ii, cap. lxxvii, 443 B.C.

[2] C. Pliny: *Medicinæ ab animalibus repertæ, Hist. Nat.*, Lib. viii, xli, 27. A.D. 77.

[3] P. Kohlstock: *Charité-Annalen*, xvii, 283, 1892.

[4] A. Schüpbach: *Zentralbl. f. Physiol.*, xxxi, 365, 1907.

[5] *The Works of Sir Benjamin Brodie*, iii, 563, 1865.

[6] Gerard van Swieten's *Commentaries upon the Aphorisms of Boerhaave*, v, 331. Eng. Trans., 1765.

[7] W. Fleiner: *Berl. klin. Woch.*, xxx, 95, 1893.

[8] W. Ebstein: *Die chronische Stuhlverstopfung.* Stuttgart, 1901.

[9] F. Penzoldt: *Handbuch d. spec. Ther. innerer Krankh.*, iv, 520. Jena, 1896.

[10] F. Schilling: *Centralbl. f. Stoffwechsel- u. Verdauungskrankh.*, i, 107, 1901.

[11] G. Herschell: *Constipation and its Modern Treatment*, second edition. London, 1899.

[12] Fr. Crämer: *Darmatonie*, p. 211. München, 1906.

[13] Stephen Hales: *Statical Essays: containing Hæmostaticks*, p. 184. London, 1733.

[14] W. Ebstein: *Die chronische Stuhlverstopfung*, p. 566. Stuttgart, 1901.

[15] J. P. Tuttle: *Diseases of the Anus, Rectum and Pelvic Colon*, p. 566. London, 1903.

CHAPTER VI

HYDROTHERAPY

According to Haller, Sancassanus in 1683 was the first to employ cold applications in the treatment of constipation. But the earliest detailed account of the employment of hydrotherapy in the treatment of constipation, which I have been able to find, is the following case related by van Swieten[1] in 1765:—

'A man aged 27 years began to complain of a slight pain in his belly with an unusual costiveness; for which various clysters, purgatives, and other medicines were used without being able to procure any stools, while in the meantime all things taken into the stomach were rejected by vomit. . . . And now the case being adjudged desperate, the patient was on the eighth day of the malady carried into a cold room, with the lower half of his body uncovered, and then in every second of time a quantity of cold water was poured upon his feet gradually ascending, until at last the cold affusion was carried as high as the pubes.' Within half an hour his bowels were well opened, and 'by the continuance of this method the space of three days, with copious discharges of indurated fæces, he escaped from the most imminent danger.'

Cold applied to any part of the skin, but particularly to the abdomen, appears to stimulate reflexly the muscular coat of the entire alimentary canal. Heat, on the other hand, has the opposite effect when applied to the abdomen; this is shown by the rapidity with which it often relieves colic due to over-activity of the intestinal contractions. Hence a cold bath taken every morning is a very valuable addition to the series of stimuli, which lead to the morning evacuation. It is particularly effective when combined with exercise in the form of swimming. For those individuals, who cannot tolerate a cold bath and who suffer from constipation owing to a deficient activity of the intestinal musculature, the cold may be applied to the abdomen alone in the manner recommended by Herschell.[2] The patient lies in a warm bath just deep enough to cover the whole body except the abdomen; tepid water is poured on to the abdomen out of a jug from a height of three feet. Every day the temperature of the water is lowered until it is ice-cold, the number of jugs of water is increased, and the mechanical stimulus is made greater by gradually raising the height, from which the water is poured, to six feet. In place of this somewhat primitive procedure, the cold water can be made to play on the abdomen through the hot water of the bath by means of a nozzle attached by an india-rubber tube to the tap. If a hydrotherapeutic institute is available, a trial may be made of the Scotch douche, in which hot and cold water are alternately played on the abdomen from a distance for ten seconds each, the pressure being gradually increased if the patient is able to tolerate it. The effect of the treatment is increased if a hot bath or electric light bath is taken immediately before it.

Numerous authorities have recommended the use of a cold compress applied to the abdomen. Two-thirds of the length of a piece of strong towelling, eighteen inches wide and long enough to encircle the abdomen three times, is soaked in very cold water for an hour. It is wrung out, and, beginning with the dry end, it is rolled up. The lower part of the trunk is then wrapped round with the towel, which is fixed by safety-pins and covered with a layer of flannel. It is put in position last thing at night and is removed first thing in the morning. It is very rare for any complaint of chilliness or discomfort to be made, and in some cases it proves exceedingly useful.

The spasm in spastic constipation and in mucomembranous colitis can often be relieved by warm applications to the abdomen. A hot bath is very useful for the purpose, or a hot compress may be applied to the abdomen. When constipation is due to some painful pelvic condition, the latter can often be relieved and the spasmodically contracted sphincter ani may be caused to relax by the use of a hot sitz-bath.

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[1] Gerard van Swieten's *Commentaries upon the Aphorisms of Boerhaave*, ix, 378. Eng. Trans., 1765.

[2] G. Herschell: *Constipation and its Modern Treatment*, p. 44, second edition. London, 1899.

CHAPTER VII

EXERCISE. SWEDISH GYMNASTICS. MASSAGE

(*a*) **Exercise.**—Regular exercise is one of the most important means of preventing constipation. It increases the appetite, it strengthens the voluntary muscles of defæcation, and it stimulates the intestinal movements by producing rapid changes in the intra-abdominal pressure. Moreover, it has a most important mental effect, as it takes the thoughts away from business cares and household worries, the depressing influence of which on the nervous system is an important factor in the production of many cases of constipation.

It is necessary, however, to avoid taking too much exercise, as the harm produced by great fatigue more than outweighs the good done by the exercise which causes it. It is important therefore that people, who are unaccustomed to exercise and are advised to take it for constipation, should begin with a mild form for periods of short duration.

Increased activity should be recommended for all constipated patients who lead a sedentary life, except for those in whom the condition is due to reflex inhibition of the intestinal movements by disease of some abdominal or pelvic organ, as the latter may be aggravated by exercise and the inhibition consequently strengthened.

Although any form of exercise is better than none, some forms are of much greater value than others in the treatment of constipation. Thus walking on the level may improve the appetite, but it is too mild an exertion to have much effect on the intra-abdominal pressure, and it does not do much to strengthen any of the muscles concerned in defæcation. Bicycling is very little better; indeed one of the severest cases of constipation Boas ever saw was in a professional cyclist. Climbing, on the other hand, is most valuable, as the diaphragm and abdominal muscles are brought into great activity, and the thighs intermittently exert considerable pressure on the abdomen. Walking in a hilly neighbourhood, quite apart from actual climbing, is much more useful than walking on the level. Dr. Collier of Oxford tells me that in an experience of over twenty years he has never seen a case of constipation in a rowing man. This is doubtless due to the important part played by the abdominal muscles in rowing, and to the recurrent pressure exerted by the thighs on the abdomen. No forms of exercise are more valuable for all the muscles of the body than skipping and swimming, and the latter has the additional advantage of affording a thermal stimulus to intestinal activity. For those who require some less strenuous exertion, riding is of value as an exercise for the diaphragm and abdominal muscles, and the constant bending in gardening and when playing bowls makes these recreations useful for the abdominal muscles.

Most German authors recommend gymnastics for constipation. They have, however, the serious disadvantage that they have to be done indoors. One of the most important effects of exercise is the stimulating effect it has on the appetite, and this is most marked, when it is taken in the open air.

(*b*) **Swedish gymnastics.**—When any of the voluntary muscles of defæcation are weak, considerable benefit can be gained by the regular performance of Swedish exercises. At first each movement may be repeated six times morning and evening, the number being gradually increased up to thirty, as the muscles become stronger, but the exact time to spend over the exercises varies in each case and depends upon the amount of fatigue produced, for the patient should always stop before he feels very tired. It is generally necessary to continue the exercises for several months, but after a time the number done can be slowly diminished.

The abdominal muscles are those which most frequently require strengthening, and it is important to remember that exercises are just as essential for the transversalis, internal and external oblique muscles as for the recti.

A few of the most useful exercises will now be described, but no list can be made which is suitable for all cases.

A. *Lying.*

1. Slowly sit up with the arms stretched forwards until the finger-tips touch the feet : then slowly lie down again. When the muscles are very weak, it is necessary at first to help the patient by supporting the shoulders at the commencement of the movement.

2. Clasp the hands together behind the neck : raise the extended legs as high as possible and slowly let them fall : raise them again before they reach the ground. Here again it is often necessary at first to help the patient by supporting the legs.

3. Sharply draw in the abdomen, let it out again, and then push it out by contracting the diaphragm. When the condition of the muscles has improved, the exercise may be repeated with a sand-bag weighing from four to ten pounds on the abdomen.

B. *Standing.*

1. Extend the arms above the head and keep the legs stiffly extended : bend the trunk forwards and try to touch the toes with the finger-tips.

2. Hang the arms by the side and keep the thighs and legs stiffly extended : bend first to one side and then to the other, trying to touch the foot with the hand of the same side.

3. With the hands on the hips, twist the body round as far as possible, first in one direction and then in the other.

4. With the hands on the hips, lean back as far as possible, and slowly move the body round the fixed pelvis, so that the head describes a large circle.

5. Raise the legs alternately as high as possible, so as to compress the abdomen with the thighs. This exercise can be replaced by going slowly upstairs two steps at a time.

6. With the hands on the hips, stand on the toes and slowly bend the knees outwards with the body bent forwards, so as to assume a squatting position with the buttocks touching the heels and the thighs pressing on the abdomen : then slowly rise again.

For patients, in whom injury to the pelvic floor has led to dyschezia, Pincus[1] recommends a special exercise, which he has found gives excellent results. The patient is told to make the movement she would do, were she trying to restrain a commencing defæcation; by this means the levator ani muscles are contracted. They should be alternately contracted and relaxed thirty times every morning and evening.

(*c*) **Massage.** Whenever constipation is due to want of activity of the intestinal musculature, the condition of the latter may be improved by abdominal massage, which exerts a directly stimulating action upon it. This can be readily demonstrated in cases of organic obstruction, when peristalsis can often be seen only after manipulating the abdomen. In dyschezia the atonic and paretic pelvic colon and rectum cannot be influenced by massage owing to their situation in the pelvis, but massage is beneficial in the numerous cases which result from weakness of the abdominal muscles.

Massage has sometimes been recommended with the object of directly forcing fæces along the colon. Not only do X-ray observations show that this can only rarely be done, but, if much force is used, there is considerable danger of injuring the intestinal wall in the attempt. It is, however, possible to soften fæcal masses in the descending and iliac colon by pressure, so that their subsequent removal by enemata is greatly facilitated. I have seen this manœuvre succeed in a case of typhoid fever, in which enemata alone had failed to remove some hard scybala, which had collected in the iliac colon.

Massage should never be employed if there is any evidence of inflammatory complications, and spastic constipation is generally made worse rather than better by this treatment.

The bladder should be emptied immediately before the massage; the patient should be recumbent and his knees raised by a pillow, in order to relax the abdominal muscles as much as possible. The massage should be repeated daily; the best time is before breakfast, as the stomach is then empty, and the massage, being added to the natural morning stimuli to defæcation, may at once result in a normal evacuation. Only when there is insufficient time in the morning, should the massage be done on retiring for the night. Its duration should at first not exceed five minutes, but it can be gradually increased up to half an hour. If it causes much fatigue, the time spent in the treatment should be diminished, and it may be necessary to limit it to three times a week. It is also advisable to discontinue the massage during the menstrual periods. Abdominal massage should not cause any pain; the production of pain is an indication that the massage is not being done skilfully, or that the condition is one which should not be treated in this way.

When it is desired to act directly on the colon, it should be remembered that the X-rays have shown that in the recumbent position the average level at which the transverse colon crosses the middle line is that of the umbilicus. It is usual to begin with massage of the cæcum and pass along the colon, finishing immediately above the pubes, although it is generally impossible to manipulate the pelvic colon.

In cases of dyschezia due to weakness of the abdominal muscles, the whole surface of the abdomen should be massaged without regard to the probable position of the colon, as the superficial muscles and not the intestinal musculature require treatment. The parts immediately above Poupart's ligament are particularly likely to be weak, so that special attention should be paid to their massage.

According to Herschell,[2] abdominal massage 'requires such special technical knowledge that unless administered by the physician himself it is useless'. I am unable to agree with this statement. In the vast majority of cases excellent results are obtained, even when the patient massages himself. This has the great advantage of costing nothing and causing very little trouble, so that the treatment is more likely to be thoroughly carried out for a sufficient period than if massage by a professional masseur is advised. 'Automassage' is best done by a method, which appears to have been suggested first by Sahli[3] in 1887: a cannon-ball, weighing from three to ten pounds, covered with chamois-leather or flannel, is rolled by the patient over the abdomen along the probable course of the colon, the same precautions being taken and the duration of treatment being the same as when the treatment is given by hand. According to Pincus the stimulating action of this 'auto-massage' can be increased by substituting for the cannon-ball a leather bag containing the same weight of small stones or fragments of iron.

When for any reason auto-massage is impossible or insufficient, a professional masseur or masseuse should be employed. It is important to give definite instructions as to whether direct stimulation of the colon is required, in addition to the more superficial massage suitable for the abdominal muscles.

Only a short description need be given here of the various manipulations, which may be used in the treatment of constipation. The treatment generally begins with *effleurage*, which consists in slow, light and continuous, stroking movements over the abdomen ; this is particularly indicated for old, feeble and sensitive individuals, who cannot stand more stimulating treatment. It is also useful when the abdominal muscles are weak, but it cannot have much effect on the intestines themselves, although the sedative action is a useful preparation for more vigorous manipulations. It is the only form of massage, which can be used in spastic constipation without aggravating the condition ; sometimes it actually relieves the enterospasm.

Pétrissage is the most useful form of massage in the majority of cases, as it has a powerful action on both the abdominal muscles and the intestines ; deep pressure is used and the tissues are kneaded and rolled between the fingers and hands. The efficacy of the treatment is sometimes increased by concluding with *tapotement*, in which the abdomen is sharply struck by a rapid series of strokes with the edge of the hands or tips of the fingers.

Vibratory Massage with the aid of more or less elaborate electrical apparatus has been recommended by Herschell, Gant and others, but the results obtained by its use hardly warrant the trouble and expense involved in carrying out the treatment, as it is not clear that it can do anything which simple massage with a cannon-ball or by the hand cannot accomplish. Moreover, it is possible to combine a certain amount of vibration with the other manipulations, when the massage is done by hand.

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[1] L. Pincus: Volkmann's *Samml. klin. Vortr.*, 474 and 475, 1908.

[2] G. Herschell: *Constipation and its Modern Treatment*, p. 53, second edition. London, 1899.

[3] H. Sahli: *Correspondenzblatt f. Schweizer Aerzte*, xvii, 581, 1887.

CHAPTER VIII

ELECTRICAL TREATMENT

(*a*) **Physiological considerations.** Authorities differ greatly as to the best methods of treating constipation by means of electricity. This is doubtless due to the fact that very little is known as to the effects of the various forms of electricity on the intestines. The only researches of importance on the subject are those of Schillbach,[1] who experimented on the exposed intestines of a rabbit, and of Laquerrière and Delherm,[2] who used guinea-pigs, rabbits and dogs. Schillbach found that faradism gave rise to contractions above and below the part stimulated, the large intestine being much less affected than the small. Galvanism had a greater effect: a local contraction occurred at the kathode and a series of peristaltic waves started from the anode. Laquerrière and Delherm found, however, that the anode produced a local contraction, similar to but stronger than the kathode, and my own observations are in agreement with this. They also observed that the contraction not only occurred on closure of the current, but continued as long as the current passed.

I have repeated these experiments on a rabbit under chloroform, and also on rabbits and cats immediately after death. In the latter the intestines were exposed the moment after the animals were killed, and were kept bathed in warm saline solution for the few minutes during which their activity remained unimpaired. My results agree on the whole with those of Laquerrière and Delherm, but I found that the action of faradism is so feeble that no contraction of the intestines occurred until the animals were thrown into general convulsions by the spread of the current.

All such experiments, however, are fallacious, as in man the electrodes cannot be applied directly to the intestine—except to the inside of the rectum—the common method being to place one or both on the abdominal wall, so that the current is much diffused by the time it reaches the intestines. I therefore placed the active electrode on the abdominal wall over the intestines, and watched the effect through an opening in the abdominal wall half an inch away from the electrode. The indifferent electrode was placed on the back or on another part of the abdomen. A very strong faradic current now produced no effect on the intestines at all, but a galvanic current still caused a local, but weaker contraction, which only advanced along the intestine when the electrode was moved. The anode again produced a distinctly greater effect than the kathode. The results were the same when one electrode was introduced into the rectum, but with galvanism a local contraction of the rectum now occurred in addition.

The experiments on dead animals are perhaps not entirely reliable, but they were always discontinued within five minutes of death, and during this period the intestines appeared to be just as active as those of a living animal. Moreover, the results obtained were precisely the same as in the living rabbit. They serve to show that, in spite of the fact that some authors (Boas,[3] Harris [4]) recommend that faradism should always be used in preference to galvanism, the latter is really much more valuable, if a direct effect on the intestines is required.

It seems probable that, when the kathode is placed on the back, moving the anode over the course of the colon will cause a wave of contraction to occur under it. If one electrode is introduced into the rectum, the rectum can also be caused to contract. Faradism can hardly have any other effect than to cause the abdominal muscles to contract, and, when the abdominal wall is thick, even galvanism probably exerts no action on the intestines, unless a stronger current is used than can comfortably be borne.

Even under favourable conditions the local effect of both faradism and galvanism cannot be great, as I could not see any sign of increased general activity or local contractions of the colon in a moderately thin patient, to whom bismuth oxychloride had been given, so that the shadow of her colon could be watched with the X-rays during the treatment.

The good results sometimes recorded are probably due to a large extent to suggestion, especially in nervous cases, the patient being persuaded that electricity is certain to do him good.

(*b*) **Indications and methods.**—The value of electricity in the treatment of constipation is thus very limited: the following are the indications and the methods of application most suitable for each:—

1. *Constipation due to weakness of the intestinal musculature.* In severe cases of this kind electrical treatment may be tried in addition to other methods, when the latter prove insufficient alone. The large kathode is placed on the back, and the smaller anode is moved slowly along the colon, starting at the cæcum; the electrode should be kept longest and be pressed most deeply over that part of the large intestine where the delay is greatest. As strong a current as the patient can bear with comfort should be used, and the treatment may be given for a quarter of an hour every morning.

2. *Spastic constipation and muco-membranous colitis.* Electricity is generally considered to be contra-indicated in cases of spastic constipation. Delherm,[5] however, has recently recommended the use of galvanism of high intensity (50 to 100 milliamperes), combined with faradism, so weak that it produces no contraction of the abdominal muscles but only a faint sensation of tingling of the skin. He claims to have obtained good results in spastic constipation and muco-membranous colitis. It is not easy to account for this,

unless it is due to the action of the current on the central nervous system, which is almost always depressed in these cases, rather than to any local effect, as Delherm's own researches with Laquerrière showed that galvanism is likely to increase rather than to diminish intestinal spasm.

3. *Dyschezia.* In severe cases of dyschezia, in which the tone and contractile power of the rectum and pelvic colon are so impaired that spontaneous evacuations do not return after some months of treatment with enemata, intra-rectal galvanism should be tried. A thick wire electrode, insulated by a soft india-rubber tube up to its olive-shaped end, is introduced three or four inches into the rectum ; the other electrode should be large and flat and placed on the lower part of the abdomen.

The treatment, which should last from five to twenty minutes, should be given daily half an hour after breakfast, as in favourable cases it often has the immediate result of producing a desire to defæcate, and this is likely to be most effective if it occurs at the natural time. In other cases the patient is able to defæcate shortly afterwards, or the improvement is only noticed after some days. Unfortunately, however, many of the worst cases derive no benefit whatever from the treatment.

Great care is required in treating constipation by intra-rectal galvanism, owing to the danger of injuring the rectal mucous membrane by electrolysis, where the bare metal of the electrode is in contact with it. The danger can, however, be greatly diminished by introducing through the tube containing the electrode a pint of normal saline solution, which is retained during the treatment. The electrode is then generally not in contact with the mucous membrane, and the current is diffused over a considerable area by the water, which acts as a large electrode. The danger of electrolysis can be further diminished by frequently reversing the current. Its strength is slowly increased to a maximum of from 30 to 40 milliamperes, according to the sensation it produces, and then slowly diminished to zero ; after reversing the direction of the current, it is again slowly increased to a maximum.

4. *Dyschezia with weak abdominal muscles.* When the abdominal muscles are weak, they undoubtedly derive benefit from the active contractions produced by faradism or labile galvanism. As exercises and massage are equally efficacious and are generally more convenient, electrical treatment should only be recommended, when special facilities for its employment are at hand. A large electrode should be placed over the lumbar spine; a smaller one is moved slowly all over the abdomen. Faradism or kathodal galvanism, either separately or combined, may be used, and the current should be as strong as the patient can bear without discomfort.

5. *Neurasthenic constipation.* When constipation is secondary to neurasthenia, electricity is often of considerable value in helping to restore the nervous system to its normal condition. The best form to employ is static electricity, which may be given for half an hour daily or three times a week.

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[1] E. Schillbach: *Virchow's Arch.*, cix, 278, 1887.

[2] Laquerrière and Delherm: *Compt. rend. Soc. de Biol.*, liv, 150 and 445, 1902.

[3] I. Boas: *Diagn. u. Ther. der Darmkrankheiten*, p. 178. Leipzig, 1901.

[4] Wilfred Harris: *Electrical Treatment*, p. 99. London, 1908.

[5] L. Delherm: *Arch. d. Mal. de l'Appar. digestif*, i, 513, 1907.

CHAPTER IX

OPERATIVE TREATMENT

When constipation is the result of some definite organic obstruction of the intestine, operative treatment is plainly indicated. But various operations have been performed for the relief of severe constipation in the absence of any such clear indications, and consequently the results hitherto obtained have not been sufficiently good to warrant surgical interference, except under most exceptional conditions.

(*a*) **Division of adhesions.**—Believing that peritoneal adhesions, especially at the hepatic flexure, are a frequent cause as well as a result of constipation, Arbuthnot Lane[1] tried the effect of dividing adhesions in constipated patients, but he soon gave up the operation, as the results obtained were unsatisfactory. In an earlier chapter it was shown that these adhesions were not really a cause or a result of constipation, so that it is not surprising that no improvement should follow their division. Moreover, it is always exceedingly difficult to prevent the re-formation of adhesions after they have been divided.

It has already been mentioned that the form of dyschezia, in which there is difficulty in the passage of fæces from the pelvic colon into the rectum, is sometimes the result of chronic peritonitis, which has fixed the pelvic colon to the rectum or the pelvic floor. When enemata have failed to relieve such cases, Tuttle [2] recommends dividing the adhesions and, if necessary, fixing the pelvic colon to the abdominal wall, so as to prevent a recurrence of the condition. Up to 1903 he had performed the operation fifteen times. Though it was not always done for simple constipation, there was no case in which the movement of the bowels was not free and comfortable after the operation. The patients, on whom the operation was performed solely for constipation, were all completely relieved.

(*b*) **Short-circuiting operations.**—The first short-circuiting operation for the relief of constipation was performed in 1900 by Mansell Moullin.[3] He made a lateral anastomosis over four inches long between the last part of the ileum and a convenient part of the sigmoid flexure : the ileum was not divided. The patient was a woman, twenty-nine years old, who, since an attack of acute colitis six years before, could only obtain an evacuation by means of enemata, and was emaciated and almost bed-ridden from starvation. The result was very satisfactory, as four years later the constipation had not returned and the patient was well in every way. Quite recently Mansell Moullin has recorded his later experience of this operation in six cases of chronic constipation. There have been no deaths, and the result in each case has been favourable ; two were operated on over two years ago, one a year and a half ago, but too short a period has elapsed in the other cases for it to be possible to decide whether the improvement will be permanent.

In the very exceptional cases of severe constipation, which are unrelieved by all other means and which are not the result of dyschezia, this operation seems to be the most rational. Before resorting to the operation, however, a thorough skiagraphic investigation should be made, in order to exclude dyschezia and to discover in what part of the large intestine the delay occurs. Thus in the very rare cases, in which there is delay at the splenic flexure, owing to the flexure being abnormally acute, a lateral anastomosis between the ascending limb of the transverse colon and the adjacent descending colon would be a more suitable operation than ileo-sigmoidostomy : in the only case of the sort (Case 13) which I have seen, the constipation was, however, completely relieved by enemata.

In cases of dyschezia due to obstruction at the pelvi-rectal flexure, an anastomosis between the pelvic colon and rectum has been established with success by Gant, when non-operative treatment and division of adhesions with fixation of the pelvic colon to the anterior abdominal wall had failed.

(*c*) **Exclusion of the colon. Colectomy.**—After his failure to relieve constipation by division of peritoneal adhesions, Lane tried the effect of exclusion of the colon by division of the end of the ileum, which was implanted into the pelvic colon or rectum. But trouble was often caused by the collection of fæcal material in the blind end of the colon : this could not have been a result of antiperistalsis, which, if it occurs at all in the human intestine, is confined to the proximal part of the colon (*vide* p. 7), but must have been due to the accumulation of the secretion of the large intestine, which is insufficient in bulk and in irritating constituents to stimulate the cæcum and colon to empty themselves without the aid of the contents of the ileum. A simple ileo-sigmoidostomy without division of the ileum has not this disadvantage.

Lane was therefore induced to try the more radical operation of colectomy, the operation which Metchnikoff[4] believes would above all things help in the realization of his dreams of a ‘ natural death ’ at the age of 140. In some cases only the cæcum and ascending colon were removed ; in others a complete excision down to the pelvic colon was performed. A series of thirty-nine cases of colectomy was published by Lane in 1908 ; of these a case of dysentery and one of ulcerative colitis must be excluded, and as some were described as cases of an 'extreme condition of auto-intoxication' without details as to the symptoms pointing to their intestinal origin being given, it is not clear how many were really suffering from constipation. If the cases of dysentery and ulcerative colitis are excluded, there remain thirty-seven cases ; of these seven died as the immediate result of the operation, one died six months later from intestinal obstruction, and one a year later from exhaustion. The immediate mortality was therefore 19 per cent., and the total mortality 24 per cent. Out of sixteen patients, who were alive a year or more after the operation, ten were relieved to a greater or less extent, and in six the result was only moderately good. Eleven out of twelve operated on between a month and a year before the date of publication were much better, and in only one was a less satisfactory report received, but in these cases insufficient time had elapsed since the operation for a proper judgment of the results to be formed.

The high mortality of the operation, even in the hands of a great abdominal surgeon, proves that it cannot be accurately described as an operation of only 'moderate severity'. Moreover the principle of the operation is wrong, as it is assumed that the cæcum and ascending colon are not performing their functions normally. My X-ray observations have proved that in a large number of the severest cases of constipation there is no delay in the passage of fæces through the colon at all, but that dyschezia is present, the act of defæcation being inefficient, largely owing to the abnormal conditions of the pelvic colon and rectum. When colectomy is performed in such cases, a normal colon is removed and an abnormal rectum and often an abnormal pelvic colon are left behind. In severe cases of constipation not due to dyschezia, delay rarely occurs before the splenic flexure is reached, so that an unoffending cæcum and ascending colon are again removed by the operation. I have never yet met with a case in which the fæcal retention in the distal part of the colon could not be overcome by the use of properly administered enemata. However unpleasant it may be to continue such treatment over long periods, or even permanently, as is necessary on rare occasions in neglected cases, it is surely preferable to put up with this inconvenience, rather than undergo an operation which, even in the most skilful hands, has a mortality of over 20 per cent., and in which the prospects of complete relief are by no means certain. The only condition, for which the operation is, in my opinion, definitely indicated, is Hirschsprung's disease. As soon as medical treatment of this has been found to be ineffective, the case should be handed over to the surgeon ; the surgical treatment, which is discussed elsewhere (p. 223), must generally end with a colectomy. The very rare cases, in which an analogous condition of enormous dilatation of the colon is acquired in later life, require similar treatment. I am convinced, too, that colectomy was the only treatment which offered any hope of success in Case 30; chronic constipation had led to the production of a volvulus of the pelvic colon and dilatation of the rest of the large intestine ; after the excision of the volvulus, it was found quite impossible by medical means to restore the over-distended colon to anything approaching a normal condition, so that its removal was the only course left open.

(*d*) **Appendicostomy.**—In 1905 Keetley[5] introduced the operation of appendicostomy as a method of treating chronic constipation : the patient is taught to pour a saline purgative or cascara, dissolved in a pint of hot water, through a catheter introduced by way of the appendix into the cæcum. By this means it is said that a painless action of the bowels can be readily obtained, but Keetley was still uncertain in 1908 whether the appendicular opening could eventually be allowed to close. In reviewing the results obtained in all his cases of appendicostomy up to the end of 1908, he claimed that the operation was the best yet devised for the relief of constipation. Excluding two cases of muco-membranous colitis, the treatment of which is discussed elsewhere, the series included five patients with constipation, all of whom were women. In one, chronic appendicitis was present, and was probably the cause of the constipation : the operation cured the appendicitis and consequently relieved the constipation. In two of the remaining cases the result was excellent, and in two it was moderately good. This operation has more to be said in its favour than colectomy, as it is comparatively simple and does not appear ever to have been fatal. It is, moreover, reasonable to expect that the colon can be more effectively washed out from above than below. But when it is remembered that fæcal accumulations occur almost exclusively in the distal part of the large intestine and in cases of dyschezia in the rectum and pelvic colon alone, it is clear that water has less distance to traverse in order to reach the accumulations, when introduced through the anus, than when introduced through the appendix. Moreover, it is not obvious what advantage can be gained by giving a saline purgative or cascara by the appendix instead of by the mouth, particularly as we have now demonstrated that the former acts only after absorption into the blood.

(*e*) **Valvotomy.**—In an earlier chapter the views of Martin and of Pennington on the production of constipation by hyperplasia of Houston's valves were discussed. Martin advises treatment by *valvotomy* or division of the valves, but, as in one of his cases peritonitis developed, and in another the operation was followed by severe hæmorrhage, Pennington introduced an ‘ automatic valve clip ’, which produces pressure necrosis of the part of the valve which it grasps. It has already been shown, however, that hyperplasia of the valves is a result and not a cause of dyschezia, and that it does not prevent the relief or cure of the dyschezia by ordinary methods of treatment, so that the operation is probably never really required.

Martin, however, states that he cured almost every one of more than a hundred cases of constipation by dividing the enlarged valves, and Pennington obtained equally good results by his valve clip. Tuttle tried Martin's operation seven times and Pennington's twelve times, but he could record permanent benefit in only two cases. The operation was always followed by an immediate increase in the frequency of defæcation, but, as the wound healed, the constipation returned. In one case, in which Tuttle used Pennington's clip, the bowels were opened two or three times daily whilst the clip was in position, although the valve was still intact and the supposed obstruction still present. It is probable, therefore, that the irritation, produced by Martin's incision and by Pennington's clip, is the cause of the initial improvement. Moreover, the stretching of the anal sphincters by the large proctoscope used for introducing the clip temporarily diminishes the resistance to defæcation offered by the narrow anal canal, which is sometimes in a state of spasm in dyschezia. The rectum is thoroughly emptied before the operation, and is kept empty whilst the wound is healing, and Martin lays stress on the importance of dietetic and other general treatment as aids to his operation. When permanent improvement occurs, it is, therefore, probably the result of the accessory treatment rather than of the operation.

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[1] W. Arbuthnot Lane: *Operative Treatment of Chronic Constipation.* London, 1904; *Brit. Med. Journ.*, 1908, i, 126.

[2] J. P. Tuttle: *Diseases of the Anus, Rectum and Pelvic Colon*, p. 554. London, 1903.

[3] C. W. Mansell Moullin: *Trans. Med. Soc.*, xxiv, 199, 1901, and *Lancet*, 1909, i, 156.

[4] E. Metchnikoff: *The Nature of Man*, chapter iv. Eng. Trans., London, 1903.

[5] C. B. Keetley: *Brit. Med. Journ.*, 1905, i, 1358, and *Proc. Royal Soc. Med.*, Nov., 1908.

CHAPTER VIII

TREATMENT OF CONSTIPATION ASSOCIATED WITH VISCEROPTOSIS

It was shown in an earlier chapter that constipation is not a result of visceroptosis, but that the two conditions, when associated together, are both due to weakness of the abdominal muscles. The indications for enemata in this form of constipation are the same as in other varieties of dyschezia. But the weakness of the abdominal muscles requires special treatment, which relieves the visceroptosis at the same time as the constipation. The use of exercises, massage and electricity in strengthening the abdominal muscles, and the importance of assuming a squatting attitude in defæcation in these cases have already been considered. In this chapter it is only necessary to refer to the use of abdominal belts.

The mildest cases of visceroptosis associated with dyschezia often recover completely without requiring any abdominal support, but in many cases a proper belt is of the greatest value. It has sometimes been taught that a belt should only be worn when the abdominal muscles are so weak that their recovery is deemed very unlikely, as improvement in the condition of the muscles is supposed to be rendered impossible by the disuse-atrophy, which the belt is believed to cause. This view is, however, erroneous; by supporting the viscera, a well-fitting belt prevents the abdominal muscles from being stretched, and they have consequently an opportunity of regaining some of their former strength.

When exercises and, in severer cases, massage and electricity are simultaneously employed, improvement is usually rapid, and it is often possible to do without the belt after a few weeks or months. A belt gives so much relief to the abdominal discomfort caused by visceroptosis, that it enables a patient to eat more without fear of dyspepsia and to take more exercise, and so indirectly helps to overcome the sluggish action of the intestines, which is frequently present in addition to the dyschezia.

A belt should reach from immediately above the symphysis pubis and Poupart's ligament to the umbilicus or higher, and should be so made that it presses the abdominal contents upwards. It should be put on whilst the patient is lying down and be laced most tightly below. It is essential that it should fit well and cause no discomfort. In milder cases of visceroptosis in women all that is necessary is to use a special straight-fronted corset, which does not constrict the waist, but supports the lower part of the abdomen.

In very severe cases of visceroptosis, when the muscles are greatly atrophied, complete rest in bed for a few weeks is of great value. The intra-abdominal pressure is reduced to a minimum and the overstretched abdominal wall and pelvic floor are given an opportunity of regaining their tone. The tension on these structures may be still further reduced by raising the bottom of the bed or by putting a firm pillow under the hips.

Much can be done to prevent visceroptosis and the associated constipation in women by proper management of the puerperium. The patient should remain in bed for the first twelve or fourteen days after parturition, or, when much bruising has occurred, especially in the case of primiparæ, for as long as three or four weeks. The first few days after getting up should be spent for the most part on a couch, and a return to full physical activity should only be permitted after about six weeks.

CHAPTER XI

TREATMENT OF DEPRESSION OF THE NERVOUS SYSTEM ASSOCIATED WITH CONSTIPATION

A CONSIDERABLE number of severe cases of constipation are the result of depression of the nervous system, or of actual neurasthenia and hypochondriasis. Permanent improvement in the constipation can only occur when the nervous system returns to a normal condition. Although direct treatment of the constipation produces some improvement in the nervous symptoms also, the best results are obtained when attention is paid primarily to the nervous condition and treatment of the constipation takes a secondary place.

Much treatment applied locally to the intestines, such as enemata, electricity—especially when intrarectal—and massage, tends to confirm the hypochondriacal tendencies of the patient. He should be encouraged to think as little as possible about his illness, and be forbidden to make minute daily examinations of his excreta. After the patient has once been thoroughly examined, he should, if no organic disease is present, be told that with perseverance in treatment he will get well, but that much depends on his own co-operation. I have often found that X-ray and sigmoidoscopic examinations are of value for their mental effect in demonstrating the absence of any organic obstruction, the dread of which is frequently a source of great worry to hypochondriac patients.

Nervous patients should avoid overwork and excitement. Whenever possible, at least one whole day or two half-days a week should be kept completely free from business or professional occupations, and an annual holiday of a month or more is essential for all neurotic individuals. A sufficient amount of exercise—if possible, in the open air—should be taken every day, but it is of the greatest importance to avoid undue fatigue.

Though the patient should not be overworked, he should, if there is any tendency to hypochondriasis, have his mind fully occupied, in order to leave as little time as possible for brooding over his illness and worrying about every trifling discomfort. He should go to bed early, as the nervous system requires as much rest as possible, and in severe cases, especially in women, it is often advisable at first to have breakfast in bed and only get up in the middle of the morning.

A cold bath or a warm bath followed by a cold douche to the spine should be used every day. Indulgence in tobacco, tea, coffee and alcohol should be strictly limited or avoided altogether.

When definite neurasthenia is present, a complete rest from the ordinary occupations is essential. In mild cases the patient should leave home and spend a quiet time in the country or by the seaside. In winter nothing gives such good results as a visit to the Swiss mountains. In other cases some English or foreign spa may be visited, where general hydrotherapeutic and perhaps electrical treatment may hasten the recovery.

In severe cases, especially when anorexia and emaciation are present, improvement may only begin when the patient is removed from his home surroundings and remains in bed for a few weeks, as in the Weir Mitchell treatment. At the same time the patient is made to eat much more than he has been accustomed to; this often results in a rapid recovery from the constipation without any local treatment at all. Hydrotherapy, massage and electricity often hasten the improvement.

Drugs should be employed as little as possible. The most frequently useful are bromides, which in some cases of nervous constipation seem almost to act as aperients. The effect of arsenic on the nervous system is also sometimes beneficial.

CHAPTER XII

TREATMENT OF SPASTIC CONSTIPATION

The depressed condition of the nervous system requires treatment in the manner described in Chapter XI. In severe cases complete mental and physical rest, which can only be obtained by remaining in bed, is required. The diet recommended for other forms of constipation is also that most suitable for the spastic variety; the morning glass of water should, however, be hot instead of cold.

Purgatives, when given alone, often fail to act and always increase the pain. On the other hand, sedatives, especially belladonna and codeine, not only relieve the pain, but they may cause the bowels to open. A quarter to one grain of extract of belladonna may be given with an equal dose of codeine in a pill three times a day. Purgatives, especially castor oil, though of little value when given alone, often greatly increase the efficacy of antispasmodics, when administered in conjunction with them. In those cases in which anal spasm is present, a belladonna suppository is invaluable. In very severe cases subcutaneous injection of atropine may alone give relief in the acuter attacks of enterospasm. Morphia should be avoided, as the condition is often very chronic, so that there is danger of a drug habit developing.

Enemata administered with a syringe generally cause pain and are rarely very effective. Injections of hot water under low pressure, however, often give a good result, and warm injections of oil in the evening are particularly useful; they relieve the spasm and frequently cause a satisfactory stool to be passed the following morning, though sometimes a high enema of water is required in addition.

Spasm of the sphincter ani is generally relieved in a few minutes by the passage of a rectal bougie. Progressively larger sizes should be introduced each day.

The pain can often be relieved by a hot bath or hot applications to the abdomen, and spasm of the sphincter ani can be quickly overcome by a hot sitz-bath.

Massage, unless very gentle, increases the spasm, and electricity generally does more harm than good.

CHAPTER XIII

TREATMENT OF MUCO-MEMBRANOUS COLITIS

Between the attacks the patients should be treated with the object of removing the two underlying factors—the abnormal condition of the nervous system and the constipation. The general treatment of depression of the nervous system, when associated with constipation, is described elsewhere (p. 321).

The constipation requires treatment by diet, drugs and enemata. The question of diet in muco-membranous colitis is fully discussed in another chapter (p. 268); in the majority of cases the best results are obtained with a generous mixed diet, containing porridge, green vegetables, fruit and wholemeal bread, together with plenty of butter and cream. The thin and anæmic patient, who has often unwisely restricted his diet, should be encouraged to eat, even if anorexia be present; improvement in the appetite frequently occurs, as soon as the weight begins to increase. A feeling of discomfort and fulness in the abdomen may occur at first, but it generally disappears within a few days of the change of diet.

At the commencement of treatment every trace of fæces accumulated in the colon must be removed. This can sometimes be done by castor oil, but is often more easily effected by means of high enemata or, in severe cases, of injections of six to ten ounces of olive oil at night, followed by an enema in the morning. Once the colon is empty, care must be taken to prevent the re-accumulation of fæces. In very mild cases a change in diet and the administration of belladonna are all that is required, but an aperient is generally needed at first in order to obtain a daily evacuation. The most effective is castor oil, taken every morning on waking (Hale White[1]). The dose must be regulated until one satisfactory stool is passed daily. As a rule, between half an ounce and an ounce is required. When castor oil cannot be taken, a saline purgative should be used. Roger[2] has found that bile contains an antimucinase, which prevents the coagulation of mucin by the mucinase of the intestinal mucous membrane. As bile is also a mild unirritating laxative, and as the colour of the fæces appears to indicate that it is deficient in some cases of muco-membranous colitis, Mathieu[3] has suggested its administration for this condition. As in the case of spastic constipation, the purgative is always most effective when combined with an antispasmodic, such as belladonna or codeine.

Mild cases can be completely relieved by general treatment, diet and drugs, but most severe cases require local treatment in addition. This can be done at home, but it is generally more effective when given at one of the spas, in which there are special facilities for intestinal lavage. Until recently Plombières stood alone in this connexion, but since 1905 the same treatment has been very efficiently carried out in Harrogate.

Dr. A. Mantle was kind enough to demonstrate to me the methods employed at Harrogate. Between one and two pints of the alkaline sulphur water at a temperature of 100° F. are introduced into the colon through a long india-rubber tube from a douche-can, suspended at a height of about two feet above the couch on which the patient lies. It is retained for a few minutes and the patient then gets up and evacuates the water, which is generally accompanied by some scybala and mucus. The proceeding is then repeated; a smaller quantity of fæces but more membranes than after the first injection are generally expelled. The ejecta are always examined and reported on by a skilled attendant. The irrigation is followed by a bath at 100° F., and a douche at 110° F. is played through the cooler water of the bath on to the abdomen with a finely perforated nozzle. The treatment is continued daily for about three weeks and excellent results are obtained.

There is probably no specific action in either the simple thermal water of Plombières or the alkaline sulphur water of Harrogate, the mechanical removal of fæces and mucus and the sedative action of the hot douche being the cause of the success of the treatment. Ordinary tap water should be used if the treatment is given at home, and injections of soap and water or astringents should be avoided, as they tend to aggravate the condition by irritating the mucous membrane. When the result is not satisfactory, olive oil may be injected in the evening and retained during the night before the high enema of water is given; because of the antimucinase it contains, ox-gall may be added to the oil.

Various operations have been performed for intractable cases of muco-membranous colitis. In the very exceptional cases, in which all other treatment has failed, an appendicostomy, as advocated particularly by Keetley, should be made, so that the colon can be thoroughly flushed with water through the opening into the appendix and so kept empty. But the result has been unsatisfactory in many cases, and with the closure of the opening into the appendix there is a considerable probability of a recurrence, as the underlying nervous condition is unaffected. In Keetley's[4] series of cases of appendicostomy, there were only two of muco-membranous colitis. One was complicated by a stone in the common bile-duct, which was removed at the same time, so that the cure was probably just as much due to this as to the appendicostomy; the other case was improved but not cured after six months. Stretton[5] has reported five cases treated in the same way. One died soon afterwards from a growth of the colon, and one had to have an ileo-sigmoidostomy performed subsequently; one was well two years later, but the remaining two, who showed improvement after a year and six weeks respectively, have not been under observation sufficiently long for any definite conclusions to be drawn. The same criticism applies to Keetley's second case.

In the very rare cases in which muco-membranous colitis is secondary to chronic or recurrent appendicitis, appendicectomy may result in a cure.

During a severe attack the patient should remain in bed. The pain can generally be relieved by means of hot applications to the abdomen. Codeine and belladonna are the most useful drugs, and in very severe cases an opium suppository may have to be administered.

[1] W. Hale White: *Membranous Colitis*, in Allbutt and Rolleston's *System of Medicine*, iii, 816, second edition, 1908.

[2] G. H. Roger: *Alimentation et Digestion*, p. 473. Paris, 1907.

[3] A. Mathieu: *Arch. des Mal. de l'App. dig.*, i, 111, 1907.

[4] C. B. Keetley: *Proc. Royal Soc. Med.*, Nov., 1908.

[5] J. L. Stretton: *Lancet*, 1908, i, 778.

PART V

THE CONSTIPATION OF INFANTS

Owing to the conditions of life in infancy being completely different from those in childhood and later years, the constipation of infants requires separate consideration both with regard to ætiology and treatment.

Up to the age of four months the bowels are opened from two to four times a day; during the remainder of the first year they are generally opened twice, but in some infants only once, a day. At first defæcation is a purely reflex act; after the second or third month the infant is gradually educated to defæcate only in response to certain external stimuli, and with the fuller development of intelligence the act comes completely under the control of the will.

Constipation in infants, as in adults, may manifest itself by the stools being too hard and so causing painful defæcation, as well as by infrequency of defæcation. In the former case the fæces are often pale and greyish yellow, not unlike those evacuated in jaundice, although no jaundice is present.

(*a*) **Ætiology.**—In rare cases the constipation of infants is due to congenital hypoplasia of the intestinal musculature or to kinks in an abnormally long pelvic colon. Constipation due to the former condition lasts through life, that due to the latter generally disappears before the age of seven; both conditions have been described in earlier chapters (pp. 49 and 105).

Most frequently constipation in infants is due to a deficiency in the stimulating qualities of the food. Human milk, the natural food of infants, contains two substances, which stimulate intestinal movements—fat and lactose. It is unusual for deficiency of either of these to be sufficiently marked to cause constipation, which is therefore rare in breast-fed children. Undiluted cow's milk contains the same percentage of fat, but only two-thirds of the lactose present in human milk. As it contains more than double the percentage of protein, it is usual to dilute it before giving it to infants, with the result that the amount of lactose and fat present is considerably less than in human milk. Hence constipation occurs very frequently among infants brought up by hand. Only if a proper quantity of cream and lactose as well as of water is added to the milk, is the substitute as stimulating to the intestinal movements as human milk. When artificial foods are used, constipation is also very likely to occur.

In infants, as well as adults, irregularity of the bowels is frequently due to dyschezia. This may result from the insufficient development of the defæcation reflex, as already described (p. 142); in such cases the reflex only occurs after a considerable quantity of fæces has collected in the rectum, where absorption of water renders the fæcal matter so hard and dry that its evacuation is difficult and painful. In other cases dyschezia is due to weakness of the abdominal muscles, which may be the result of malnutrition, or of stretching caused by flatulent distension of the stomach and intestines.

If the stools are very hard, defæcation may be voluntarily inhibited on account of the pain experienced in their evacuation; this is particularly severe if an anal ulcer is present, and in such cases the constipation is aggravated by spasm of the sphincter ani. Anal ulcer, however, is an exceedingly rare condition in infants: Still[1] has only observed it once or twice among many thousands of infants treated by him for constipation. Lastly, in rare cases congenital narrowness of the anal orifice may be a cause of severe constipation, which can be completely relieved by stretching or incising the sphincter ani.

(*b*) **Treatment.**—1 *Diet.*—It is important to see that the infant is fed at regular intervals and that proper quantities are always given. In infants, who are not breast-fed, constipation can often be cured at once by the addition of a teaspoonful each of cream and lactose to every three or four ounces of the undiluted cow's milk, the exact dilution depending upon the age of the infant. When this fails, half to one teaspoonful of malt extract or manna may be added instead of the lactose to three or four of the day's feeds.

In breast-fed infants a half or a whole teaspoonful of lactose, dissolved in a little warm water, may be given before each nursing, or one or two of the day's feeds may be replaced by cow's milk containing manna or malt extract or by one of the proprietary malted infant foods.

In hot weather excessive loss of fluid in the sweat may lead to constipation by causing the fæces to be abnormally dry, the urine being also scanty and high-coloured. In such cases, whether the infant is fed at the breast or artificially, a little cold boiled water, to which some fruit juice may be added, should be given several times a day in addition to the ordinary feeds.

2. *Massage.*—When the colon is insufficiently active or the abdominal muscles are weak, excellent results are obtained by gentle massage of the abdomen. In young infants this is best done while they are at the breast or bottle, as the abdomen is then lax, and the treatment is not likely to be interrupted by the infant crying. With some infants, however, there is no difficulty in rubbing and kneading the abdomen, whilst they are lying down. The massage should be repeated two or three times a day for five minutes.

3. *Stimulation of defæcation.*—Those cases of constipation in infants, which are due to want of development of the defæcation reflex, can be recognized by the fact that the introduction of the finger into the rectum is immediately followed by defæcation. Until the reflex becomes more active, the regularity of the bowels can be maintained by increasing the stimulation of the rectum by the introduction of a small piece of Castile soap, about two inches long and half an inch thick, cut into the shape of a cone with a blunt end; the tip is smeared with vaseline, and the cone is pushed half its length into the rectum and held in position for three or four minutes, or until the action of the bowels begins. When this fails a small glycerine suppository, which

combines chemical with mechanical stimulation, may be tried, but it should be reserved for exceptional occasions, as it is too irritating to be safely used for long in infants, and it tends to make the rectal mucous membrane insensitive to weaker and more natural stimuli.

When the cone of soap proves an insufficient stimulus to peristalsis, it is generally wiser to have recourse to injections of water, which may be given every day without fear of injuring the intestine or making their permanent employment necessary. The water should never be given by means of a syringe, but should be introduced under very low pressure through a catheter, connected with a glass funnel. Half an ounce to one ounce is sufficient for a new-born infant; the amount can be increased to three ounces at the age of three months, and six ounces for children a year old. When a warm injection is insufficiently stimulating, cold water can be safely substituted for it. In obstinate cases of fæcal impaction in the rectum half an ounce of olive oil may be injected in the evening, the injection of water being given next morning.

Those cases of infantile constipation, which are due to kinking of an abnormally long pelvic colon (p. 105), are best relieved by the daily use of enemata. Purgatives are not indicated, as the passage of fæces through the large intestine as far as the pelvic colon is normal in rate. According to Jacobi,[2] the treatment may have to be continued for between five and seven years, when the constipation spontaneously disappears, owing to the establishment of the proper anatomical relationships of the colon.

Regularity in defæcation is, as in adults, of the utmost importance. Even in the first four weeks of life infants can be taught to be regular by being held over a suitable receptacle twice daily at the same hours, the first occasion being immediately after the first or second feed of the day, and the second about twelve hours later. If a further stimulus is required, a cone of soap should be introduced into the rectum before putting the infant on the chamber.

4. *Drugs.*—In recent years it has been commonly taught that drugs should only be used for the constipation of infants

when all other means have failed, and that their use should be gradually discontinued as soon as the bowels become regular. There is no doubt that very troublesome disturbances of digestion are frequently the result of the unauthorized administration of aperients to young infants by the mother or nurse.

Still, however, strongly advocates the use of purgatives for the constipation of infants in preference to all other methods of treatment, as he regards attempts to correct constipation by diet as a very common cause of digestive disturbances. He advises the regular use of aperients for several weeks, when there is any tendency to constipation; this is clearly much more rational than intermittent treatment with comparatively large doses.

One of the best aperients for infants, apart from lactose, malt extract and manna, which have already been referred to in discussing diet, is magnesium sulphate. Two to five grains may be given two or three times a day to very young infants, and the dose can be increased if necessary; it is best administered in a drachm of dill water with ten minims of glycerine, which acts as a mild aperient and makes the mixture more palatable; nux vomica may be added if there is much atony, and belladonna if colic is present.

Still recommends grey powder in half-grain doses, to be taken three times a day. In severer cases small doses of syrup of senna or tincture of aloes may be tried.

Castor oil and calomel are valuable for occasional use, but for chronic constipation in infants these and other strong purgatives should never be employed. Castor oil is particularly harmful, as, after its initial purgative action, it tends to aggravate the constipation.

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[1] G. F. Still: *Common Disorders and Diseases of Children*, p. 199. London, 1909.

[2] A. Jacobi: *New York Med. Record*, xlv, 613, 1894.

APPENDIX

THE ADMINISTRATION OF BISMUTH SALTS FOR THE SKIAGRAPHIC EXAMINATION OF THE ALIMENTARY CANAL

In order to obtain reliable results in examining the alimentary canal with the X-rays, it is important that a proper quantity of the proper salt of bismuth should be used. In these notes I shall give my reasons for selecting the oxychloride. I am indebted to Mr. Finnemore, the Pharmacist of Guy's Hospital, for carrying out some investigations for me on the chemical processes involved.

Until recently it was believed that bismuth salts could not be taken safely in doses larger than a drachm. This idea seems to have been handed down from the period when bismuth compounds were generally contaminated with arsenic, the poisonous action of which was erroneously ascribed to the bismuth. In 1897 Roux and Balthazar gave five drachms of bismuth subnitrate for diagnostic purposes, and soon afterwards Rieder found that an ounce could be administered without danger. A number of observations show, however, that bismuth subnitrate, the salt first employed and the one still most extensively used abroad, occasionally gives rise to severe poisoning, when large doses are given.

Cases have even been reported in Germany, in which death has occurred after the administration of bismuth subnitrate for diagnostic purposes. Thus Böhme[1] gave an eighteen-months-old marasmic child, suffering from gastro-intestinal disturbance, 'several' grammes by mouth and two days later by rectum. Three hours after the second dose the child was seized with pain and diarrhœa; he became cyanosed and dyspnœic and died in half an hour. A child, three weeks old, suffering from gastro-enteritis had previously died in the same hospital with similar symptoms after the administration of 4 grammes of bismuth subnitrate by mouth. Two fatal cases were also reported in 1908. Erich Meyer's[2] case was a man of twenty, who became suddenly collapsed and cyanosed three hours after taking an ounce and a half of bismuth subnitrate, death occurring a few hours later. In the case described by Nowak and Gütig[3], half an ounce of the same salt was given by rectum to a man of forty-four; a rigor with somnolence and cyanosis followed, and death occurred in four hours. Worder, Sailer and Pancoast[4] described six cases, in which alarming symptoms of poisoning were observed in adults after two to four ounces of perfectly pure bismuth subnitrate had been given in one dose. The symptoms, which came on from one to four hours after the bismuth had been given, whether by mouth or rectum, were probably produced by the acid and not by the base of the salt, as no similar accidents have occurred when the carbonate has been given, and the symptoms were quite unlike those generally produced by acute poisoning with heavy metals. Böhme, Meyer and the American authors suggest that some nitrite was formed from the subnitrate, as the symptoms (nausea, cyanosis, prostration, full bounding and rapid pulse and fast respiration) were similar to those of nitrite poisoning. Moreover, Böhme found nitrous acid in the blood and pericardial fluid of his patient after death, and methæmoglobin was present in the blood in his cases and also in those of Meyer and of Nowak and Gütig. Meyer also found a trace of nitrite in the blood and urine, and a large quantity in the intestines. In the stomach nitric acid is produced by the action of the gastric juice on bismuth subnitrate. If sufficient hydrochloric acid is present to act on all of the very large doses of bismuth subnitrate given, the residue of the salt is converted by the alkaline juices in the intestines into the oxycarbonate with simultaneous formation of sodium nitrate. A small part of the latter is converted into sodium nitrite, the reduction probably occurring in the intestines, as Böhme found that when fæces are added to bismuth subnitrate *in vitro* nitrous acid is formed. From four ounces of bismuth subnitrate one ounce of sodium nitrate is formed, so that even if only a very small proportion of the nitrate is reduced, a dangerously large quantity of nitrite might be absorbed.

As it is thus unsafe to use the subnitrate in large doses, I employed the carbonate for my earliest investigations. I have given between one and two ounces of the salt on numerous occasions both to healthy individuals and to patients, without ever observing the smallest ill effect. The carbonate has, however, one disadvantage, which the subnitrate has not. When the latter comes in contact with the gastric juice the formation of bismuth oxychloride is associated with the liberation of free nitric acid in amount exactly equivalent to the hydrochloric acid used up. Hence the acidity of the gastric juice remains unaltered. On the other hand, a large dose of the carbonate completely neutralizes all the free hydrochloric acid in the stomach, and the carbon dioxide liberated does not to any material extent replace it. The all-important influence of the free acid in the stomach on the control of the pylorus is thus lost, and the rate at which the stomach empties becomes abnormal, although the actual movements of the stomach and intestines are not materially disturbed. In order to avoid this source of error, I have used since February, 1908, bismuth oxychloride in two-ounce doses instead of the carbonate. This is chemically quite inert in the stomach, and it is also uninfluenced by the alkaline intestinal contents. As in the case of all other bismuth salts, a small proportion is converted into sulphide by the free sulphuretted hydrogen present in the large intestine, but this cannot have any material influence on the intestinal movements.

Neither constipation nor any other disturbance in the normal activity of the alimentary canal was ever produced with either the carbonate or the oxychloride, so that the time relations obtained by means of the X-rays can be looked upon as normal and uninfluenced by the bismuth meals. Messrs. Cook and Schlesinger have, at my suggestion, proved this very conclusively with the aid of a modification of a method introduced by Harley and Goodbody [5] for the investigation of the motor activity of the alimentary canal. These authors gave two drachms of charcoal in water before breakfast, and observed when the charcoal appeared in the fæces. Cook and Schlesinger, after an initial experiment of this sort, took charcoal on subsequent occasions at later hours of the day, their bowels being regularly open in the morning at about 9 a.m. By this means they found what was the shortest time required for the charcoal to appear in their fæces. On repeating the investigations with two ounces of bismuth oxychloride added to the charcoal, they found that the time required was unaltered.

[1] A. Böhme: *Arch. f. exper. Path. u. Pharm.*, lvii, 441, 1907.

[2] E. Meyer: *Therap. Monatshefte*, xxii, 388, 1908.

[3] L. Nowak and C. Gütig: *Berl. klin. Woch.*, xlv, 1764, 1908.

[4] Charles B. Worder, Joseph Sailer and Henry K. Pancoast: *Univ. of Pennsylvania Med. Bull.*, xix, 131 and 137, 1906.

[5] Vaughan Harley and F. W. Goodbody: *The Chemical Investigation of Gastric and Intestinal Diseases*, p. 172. London, 1906.

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